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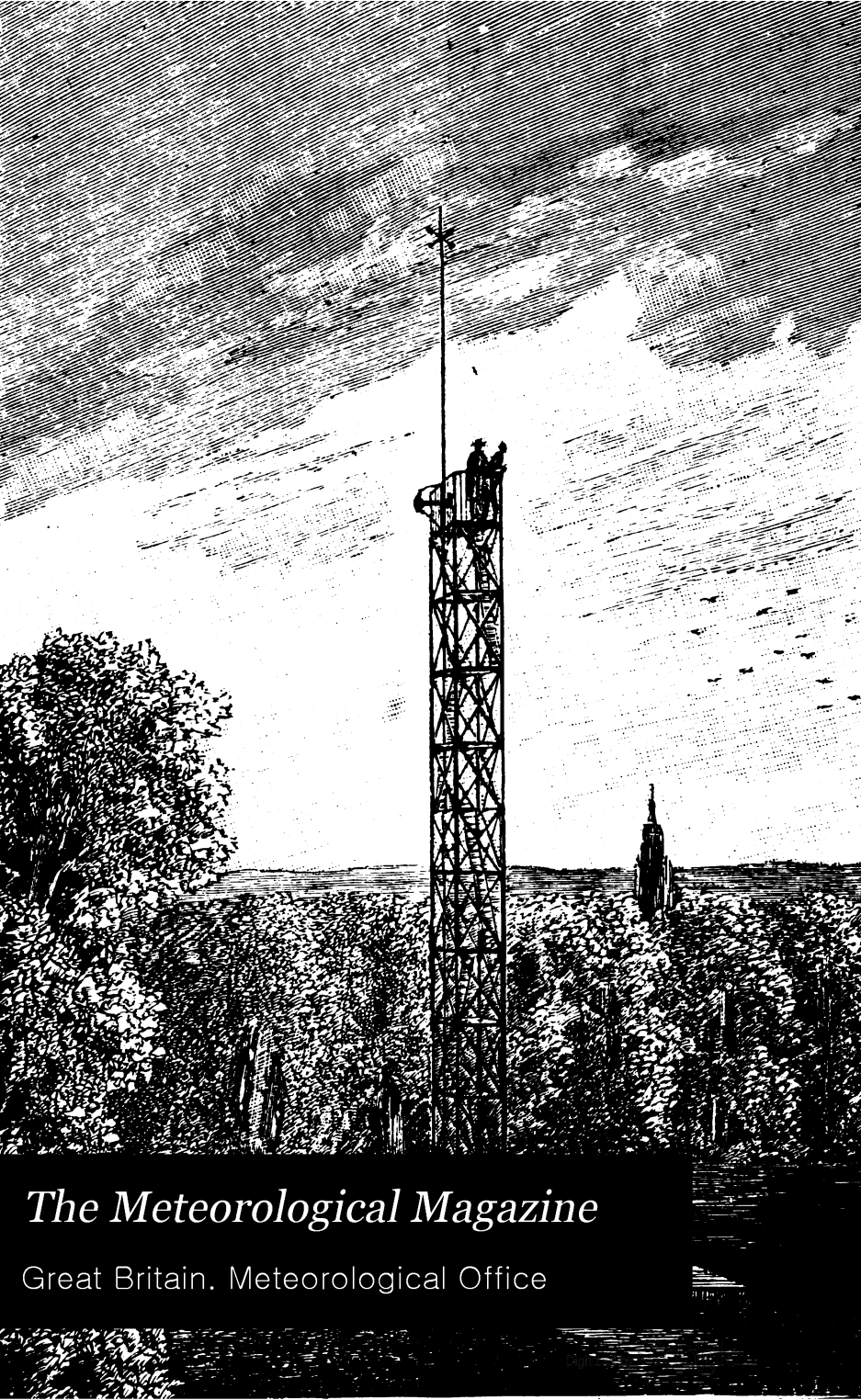

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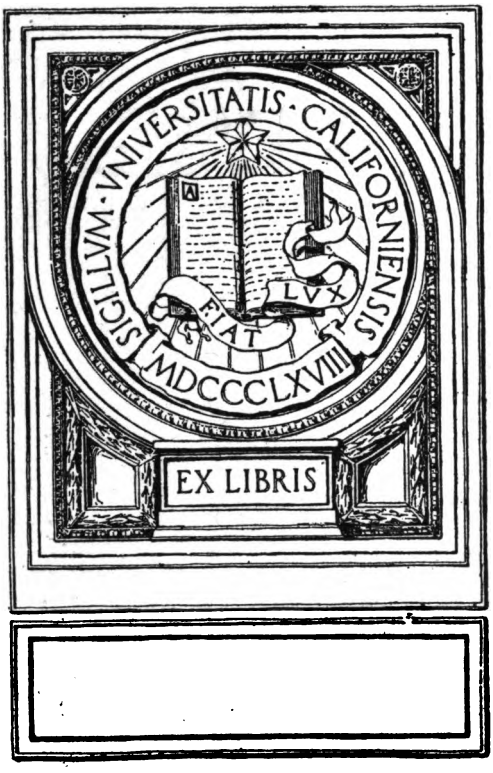

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# SYMONS'S

MONTHLY

# METEOROLOGICAL

# MAGAZINE.

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VOLUME THE NINETEENTH.

1884.

LONDON:
EDWARD STANFORD, CHARING CROSS, S.W.,
AND ALL BOOKSELLERS.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXVII.] FEBRUARY, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE STORMS & BAROMETRIC DISTURBANCES JANUARY 20TH—26TH.

WE have often expressed our strong objection to duplicate work. There is little doubt that as the most striking phenomena during the above period occurred in Scotland, we shall in due time receive an exhaustive report from the Scottish Meteorological Society. In the interim a short article, presumably by Mr. Buchan, has appeared in *Nature*, and Mr. Marriott is preparing an outline of the phenomena for the meeting of the Royal Meteorological Society on February 20th. We have therefore transferred to him the communications which we have received upon the subject; and also many of the references to the storm of the 26th which would otherwise have appeared in the "Remarks on the Month."

But it would scarcely be right to issue this number without a few words as to the unusual phenomena.

I. At Stornoway, Isle of Lewis, off the N.W. of Scotland, on January 20th, at 6 p.m. the barometer was 30·17 in., by 10 p.m. it had fallen to 29·21 in., a fall of 0·96 in. in four hours; it is said to be, and probably is, the greatest fall in so short a time yet recorded in the British Isles.

II. During the passage of this storm across the Orkneys, the anemometer at Sandwick Manse indicated a rate of 88 miles an hour, which is said to be "the highest speed at which wind has been known to travel in Great Britain."

III. During the afternoon, evening and night of 26th there was a great decrease of barometric pressure. In London it fell to 28·529 in. at 7·30 p.m., a point only passed four times during the last 26 years—but this was as nothing compared with the depression further north—where it went more than an inch lower. The lowest return which we have yet personally received was one from the Rev. Dr. Beverley of Aberdeen, whose standard barometer with a Kew certificate gave 27·381 inches as the sea level pressure at 11·30 p.m. This is thoroughly supported by a reading made at the same time at the Forest of Glen Tana, by Mr. Cunliffe Brooks, M.P., which works out



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27·39 in. *Nature*, however, quotes a reading still lower, but as it does not state whether it was reduced to sea level we can only give it as it is given, "Ochtertyre, near Crieff, 27·332 in. at 9·45 p.m."

There is (we consider) no doubt that this is the lowest sea level pressure ever recorded in the British Isles. It is extremely rare for it to be less than 28 inches. In London there is one such case on record, *viz.* December 25th, 1821, reported as 27·93 in. In the North of Scotland, owing to the normal path of storm centres traversing that country, pressures vary more, and are as a rule lower—about 0·20 in. so that the equivalent of the London absolute mininum of 27·93 would be for North of Scotland about 27·73 in. *Nature* tells us that at Gordon Castle between 1767 and 1827 the min. was 28·01 in.; that at Culloden House between 1841 and 1884 the min. was 27·98 in.; and that during the great storm of January 7th 1839 the pressure fell to 27·81 at Inchkeith, to 27·72 at Peterhead, and to 27·70 at Aberdeen. But neither the writer in *Nature* nor any one else seems to have remembered a more recent and more remarkable depression than any of these—*viz.* that of December 31st, 1865. The sea level pressure at 24 Scotch lighthouses is given in *Meteorological Magazine*, Vol. I. p. 16, and from it we find that the pressure at the Butt of Lewis fell to 27·69 in. and at Monach to 27·92 (27·63 is reported from Hoy Low light, but is not supported by the Cantickhead return and therefore we print it in parenthesis, though it is quite possible that the Hoy man watched for the minimum, and that the Cantickhead man did not). It is evident that the recent minimum is at least a quarter of an inch below the lowest of these, and hence we are doubtless justified in believing that it is without precedent since the invention of barometers.

IV. There is one other feature which we believe to be also rare, though perhaps not without precedent—*viz.*, the rapid rise from the lowest point, which occurred in some of the Southern parts of England. All practised observers know that during violent storms the mercury in a barometer "pumps" with nearly every gust of wind, indeed even the hand of a good aneroid will be found to move up and down through ·02 or ·03, but there was something more than the mere rise from a very low point reached during pumping.

The facts for four stations are

| County. | Station. | Increase. in. | Time. h. m. | | h. m. | Duration. minutes. | Rate per hour. |
|---|---|---|---|---|---|---|---|
| Devon..... | Torquay (Babbacombe)... | 0·030 | ... 5 18 | to | 5 22 | ... 4 | ... 0·45 |
| Middlesex. | Isleworth (Spring Grove). | 0·050 | ... 7 24 | to | 7 31 | ... 7 | ... 0·43 |
| ,, | Camden Square ..... | 0·061 | ... 7 33 | to | 7 41 | ... 8 | ... 0·46 |
| Essex ..... | Harlow (Toppesfield).. ... | 0·05 or 0·06 | ... | — | | ...5 to 7... | 0·55 |

There is, we think, little doubt as to the cause of this sudden rise, but as Mr. Marriott's attention has been drawn to it and as he has additional details we leave the matter in his hands.

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## MILD WINTER.

*To the Editor of the Meteorological Magazine.*

SIR,—I enclose list of plants in blossom. They are all *out-of-door, garden* plants. Although some are of course mere spurts and survivals, most are really fresh blossoms. The frost here on November 15th, 4ft. above ground, 20°·4; grass, 18°·1 (much more severe than in London), cut off almost all then in blossom, and up to that time we had all the tender plants in full bloom, otherwise we should have had a much longer list.—Truly yours,

H. SOUTHALL.

*The Graig, Ross, January 12th, 1884.*

---

*List of Plants in Blossom in the neighbourhood of Ross, Herefordshire, December 31st, 1883, to January 12th, 1884.*

Alyssum saxatile (Golden tuft).
Anemone coronaria.
Anthemis tinctoria.
Arabis albida ("Snow on the mountains").
Aubrietia grandiflora.
Auricula.
Bellis perennis flora-plena (double-daisy).
Berberis aquifolium.
,, Darwinii.
,, ?
Brassica.
Calendula arvensis.
,, officinalis (marigold).
Chrysanthemum.
Corchorus japonica.
Corydalis lutea (Fumitory).
Crocus.
Cyclamen coum.
Daphne mezereum.
,, Fioniana.
Dianthus barbatus (Sweet William).
,, ? (common pink).
Doronicum clusii.
Eranthis hyemalis (winter aconite).
Erica vagans.
,, ciliaris.
,, carnea.
,, mediterranea.
Erigeron bellidifolius.
Erysimum pulchellum.
Fragaria vesca (strawberry).
Galanthus nivalis (snowdrop).
Garrya elliptica.
Helleborus niger (Christmas rose).
,, fœtidus (bear's foot).
Hepatica cærulea.
,, rubra.
Hesperis albiflora (single rocket).
Jasminum nudiflorum (winter jasmine).
Lamium maculatum (variegated dead nettle).
Laurestinus.
Limnanthes Douglasii.
Linaria cymbalaria (ivy-leaved toad flax).
Lithospermum prostratum.
Lychnis dioica.
Mathiola flore-pleno (double stock).
Megasea crassifolia.
Menziesia polifolia-bicolor.
Myosotis dissitiflora.
Nemophila insignis.
Omphalodes verna.
Penstemon (*bud*).
Polyanthus.
Potentilla alba.
,, opaca.
Primula vulgaris.
,, veris (cowslip).
,, (double lilac).
Pyrethrum parthenium (feverfew).
Pyrus japonica.
Pear.
Reseda lutea (mignonette).
Rhododendron atrovirens
,, ?
Rose (*bud*).
Symphytum caucasicum.
Tritoma uvaria (flame-flower).
Tussilago fragrans (fragrant coltsfoot).
Ulex europœus (furze).
Veronica rupestris.
,, taurica.
,, ?
Vinca major (periwinkle).
,, minor.
Viola odorata.
,, (Russian).
,, tricolor (garden pansy).
Virginian stock.

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## METEOROLOGY AND THE INTERNATIONAL HEALTH EXHIBITION.

THE important influences which both climate and weather exert upon health render it obvious that an International Health Exhibition would be incomplete without a Meteorological Section. We are glad to be able to state that there seems reason to hope for an efficient representation of those branches of Meteorology which bear upon Public Health.

The Committee nominated to supervise the arrangements consists of—

W. B. Bryan, Esq., M.I.C.E., F.R.Met.Soc.
Prof. De Chaumont, M.D., F.R.S.
J. Evans, Esq., D.C.L., F.R.S.
Capt. Douglas Galton, C.B, F.R.S.
Thos. Hawksley, P.P.I.C.E., F.R.S.
R. H. Scott, F.R.S., P.R.Met.Soc.
G. J. Symons, F.R.S., Sec.R.Met.Soc.
J. W. Tripe, M.D., Sec.R.Met.Soc.

The Committee believe that the Royal Meteorological Society will arrange for the establishment in the grounds of a complete climatological station, properly fenced in, but to which a limited number of the public could from time to time be admitted, and it is intended that the instruments should be recorded regularly and the results exhibited on diagrams.

As regards general exhibits, the Committee invite authors of Papers upon the relations between health and disease, rainfall, percolation, evaporation, and flow from ground, and other subjects embraced by the Exhibition, inviting them to exhibit diagrams, models and apparatus illustrative of their researches.

This list of specified subjects indicates the broad views which the Committee entertain, and we submit the invitation to our readers, requesting their attention to it, and merely adding, in conclusion, that all communications should be addressed—

The Secretary,
International Health Exhibition,
(Meteorological Sub-Committee). South Kensington.

---

## THE ATMOSPHERIC DISTURBANCE, DECEMBER 10TH-16TH, AND ITS EFFECTS UPON THE BAROMETER AND THE UNDERGROUND WATER AT MAGHULL, LIVERPOOL.

By ISAAC ROBERTS, F.G.S., F.R.A.S.

A GALE of great severity, occurred here between the 10th and 16th of this month, causing considerable injury to property. Chimney stacks were blown down and trees were uprooted.

The annexed diagram shows the effects of the atmospheric disturbance upon the barometer and upon the underground water in the Triassic rocks of this district. Referring to the diagram it will be seen that at ten o'clock on Monday morning, the 10th, the barometer stood at 29·82 inches, and the level of the underground water at the same time was 22·80 inches above my zero mark.

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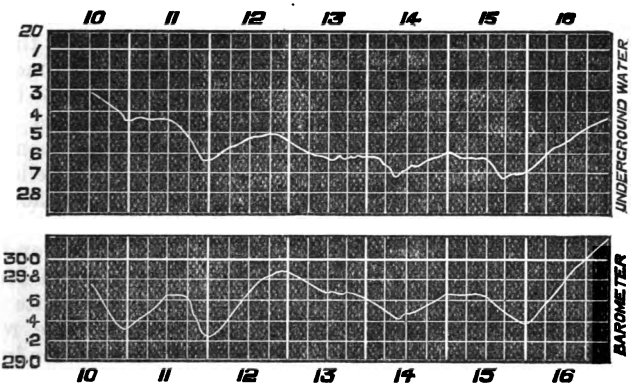
At 11 o'clock at night the water had risen to 24·42 inches, and at midnight the barometer had fallen to 29·30 inches. Between that time and noon of the 11th, the barometer had risen to 29·62 inches, and the water had fallen 0·11 of an inch. The barometer remained steadily at 29·62 inches for 5 hours, but during that interval the water was rapidly rising—it rose 0·73 of an inch during the time, and contined to rise rapidly till half-past 10 o'clock at night on the 11th. The rise of the water between noon and ten o'clock, was 2·20 inches and the barometer had fallen 0·40 of an inch in 5 hours. It was during the night of the 11th (at 1h. 30m. a.m. on 12th) that the force of the gale blew down chimney-stacks and uprooted trees.

The wind continued high during the four following days, and the undulations of the two curves drawn on the diagram, show the periods of varying disturbance.

At four o'clock on the 15th, the water touched the highest point, namely, 27·12 inches, but the barometer did not fall so low as shown on the 11th.

It will be observed in correlating the oscillations shown by the two curves, that the underground water, besides having greater amplitude, is more sensitive to changes of pressure than the barometer, notwithstanding the effects of friction and capillary action, to which the water is subject in the pores of the rock.

*Maghull, 27th, December*, 1883.




[The diagram sent was a tracing from the instruments on a scale far too large for reproduction. In reducing it we have made several alterations respecting which a few remarks may be useful. The level of underground water rises as atmospheric pressure decreases, therefore a comparison of the curves is facilitated by making them read in opposite directions, so that the run of the curves may be similar. We have therefore reversed the underground water scale so that the parallelism of the two curves becomes self-evident.

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Moreover, it is essential that the amplitude of the two scales be nearly the same. The specific gravity of Mercury being 13½, one would on first thoughts expect that the scale for the water should be rather less than $\frac{1}{12}$ th of that for the barometer—but upon trying that scale, it was found to be much too small—possibly because friction plays an important part in underground water fluctuation. At any rate we found that a scale of $\frac{1}{8}$th was about the best—and that is what we have adopted.

There remain some irregularities as to time, and as to quantity, which are possibly due to the influence of rainfall on subterranean water level, and others for which we cannot at present account—for example it is not obvious why the maximum water level should have been at 4 p.m. on 15th, and the corresponding barometric minimum 6 hours *later*.—ED.]

---

## ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on January 16th. Mr. J. K. Laughton, F.R.A.S., President, in the Chair.

The Secretary read the Report of the Council, which showed that the past few months mark a very important epoch in the history of the Society. In October the Council received the intimation that Her Majesty had been graciously pleased to grant the Society permission to assume the prefix "Royal." In December the Fellows made certain alterations in the by-laws by which the annual subscription has been increased. The Report also showed that the Society is doing much practical work, not only by holding meetings and publishing the papers read at the same, but also by the establishment of a large number of observing stations, which are regularly inspected, so that the results obtained from them may be strictly uniform and comparable. The number of Fellows is 549, and of Honorary Members 19—thus making a total of 568.

The President then delivered his Address, in which he referred to the experiments made by Mr. Saxon Snell, Mr. Bertram and Mr. Hele Shaw with the object of determining the coefficients of Biram's anemometers; as yet these can scarcely be considered quite satisfactory; for though made with the utmost care, they give results differing from each other by nearly 25 per cent. and from the known truth in opposite directions.

The reduction of barometric readings to sea-level is another problem of great interest and importance, the solution of which is far from perfect, and as applied to the converse determination of altitudes has been pronounced by Mr. Gilbert of the U.S. Geological Survey to be beset with difficulties "so numerous and so baffling, that there is no reason to hope that they will ever be fully overcome." In many cases, too, the reduction, even if correct, implies an accumulation of air in places where no air exists: and isobars so drawn, traversing mighty mountain ranges such as the Rocky Mountains or

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the Himalayas, or elevated plateaus, such as those of Central or Eastern Asia, convey an impression which may easily lead to serious mistakes.

The great achievement of the year is unquestionably the gathering in of the observations taken, by international agreement, at nine Arctic stations, in which amidst circumstances of more or less discomfort, parties continued observing through a full period of twelve months. With one station established by the United States on the shores of Lady Franklin Bay, it has been found impossible to communicate: this was established in the summer of 1881, and no trustworthy news has since been received. Preliminary reports have been published from the English station at Fort Rae, on the northern shores of the Great Slave Lake; from the German station in Cumberland Sound; from the Austrian at Jan Mayen, and from some of the others; but the principal interest attaches not to the observations taken separately—but to the collation and comparison of the whole, which may be expected to lead the way towards the solution of problems of the greatest importance to Meteorology. In the present day one science is so mixed up with a number of others, and so involved in them, that it is impossible to separate them, or to define the exact limits of each. Many of the problems of Meteorology belong equally to Geography, or at times even to experimental physics, and an address which speaks of the progress of Meteorology is perhaps apt to appear in some degree discursive. Hence it is that the true student of Nature, whilst limiting his detailed work to one particular direction, must consider her kingdom as a grand and comprehensive whole one and indivisible.

The following gentlemen were elected the officers and council for the ensuing year:—

*President.*—Robert Henry Scott, M.A., F.R.S., F.G.S.

*Vice-Presidents.*—Hon. Ralph Abercromby, Edmund Douglas Archibald, M.A.; John Knox Laughton, M.A., F.R.A.S., F.R.G.S.; William Marcet, M.D., F.R.S., F.C.S.

*Treasurer.*—Henry Perigal, F.R.A.S.

*Trustees.*—Hon. Francis Albert Rollo Russell, M.A.; Stephen William Silver, F.R.G.S.

*Secretaries.*—George James Symons, F.R.S.; John William Tripe, M.D., M.R.C.P.Ed.

*Foreign Secretary.*—George Mathews Whipple, B.Sc., F.R.A.S.

*Council.*—William Morris Beaufort, F.R.A.S., F.R.G.S.; George Chatterton, M.A., M.Inst.C.E.; John Sandford Dyason, F.R.G.S.; William Ellis, F.R.A.S.; Charles Harding; Richard Inwards, F.R.A.S.; Baldwin Latham, M.Inst.C.E., F.G.S.; Robert John Lecky, F.R.A.S.; Edward Mawley, F.R.H.S.; Cuthbert E. Peek, M.A., F.R.G.S.; Capt. Henry Toynbee, F.R.A.S.; Charles Theodore Williams, M.A., M.D., F.R.C.P.

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## REVIEWS.

*Transit Tables for* 1884. By LATIMER CLARK, M.I.C.E. London: E. and F. N. Spon. Crown 8vo.

*Manual of the Transit Instrument as used for obtaining Correct Time.* By LATIMER CLARK, M.I.C.E. London, 1884. E. and F. N. Spon. 40 + 16 pages crown 8vo.

THOSE of our readers who remember the persistency with which we have pleaded for greater care being bestowed by meteorologists in the obtaining and keeping of their clocks and watches at "True Time," will understand the pleasure with which we have watched Mr. Latimer Clark's efforts towards popularizing the Transit instrument.

The second of the above works is so low in price and gives so clear a summary of Mr. Clark's efforts, that instead of occupying space with extracts from it, we think it better to advise our readers to get a copy, for even if they do not decide upon purchasing a Transit instrument, they will certainly get a good shillingsworth of instruction.

As regards the Transit tables, we have only one (and it is a very small) complaint to make. We think that the table should give the time of passage of semi-diameter of Sun for each day. It is often impossible to observe more than one limb, and then this datum is indispensable; it would only need a very narrow column, and space could easily be made for it. On all these grounds we rely upon the author adding it in his next annual tables. It is true that the information is (incompletely) given in his other books, but it ought to be handy in an adjoining column.

Mr. Latimer Clark has not limited his efforts to teaching persons how to observe, and reducing the difficulty of calculations to a minimum, but he has brought his well-known mechanical skill to bear upon the construction of cheap and hardy instruments, and brought out patterns which have met the approval of such men as Col. Tupman and Mr. Lecky, to which it is needless to add our own opinion. But, in conclusion, we should like to suggest for Mr. Latimer Clark's consideration, that we desire to see an instrument which would be less accurate than are his, and, of course, which should be obtainable at a proportionally less price. Mr. Lecky says that with Mr. Clark's smaller Transit Instrument, a fair night's work ought to fix the time to a fifth of a second. Now none but those possessed of exceptionally good chronometers or regulators can *keep* such time when they have got it.

Mr. Lecky evidently was speaking of the average of a number of observations, and the precision would increase with the number. While we have no objection to such precision, we think that it would be reasonable to say that all ordinary meteorological requirements will be met by an instrument whereby a single observation

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should always be true to 15 seconds, which probably implies that its delicacy should be about one-tenth that of those now submitted.

If observers will keep their clocks and watches right to a second, by all means let them do so; no one would rejoice at such a state of things more than we should. But rather than that they should continue to let them be anywhere "within five minutes," let us try to place before them something which shall give them Time, true within a quarter of a minute, as easily as possible, and at a price which cannot be made an excuse for not providing it.

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*A Manual of Practical Hygiene*, by E. A. PARKES, M.D., F.R.S., edited by F. S. B. FRANÇOIS DE CHAUMONT, M.D., F.R.S. Sixth Edition. J. and A. Churchill, London, 1883. 8vo., xix—731 pp.

WE can readily imagine that a meteorologist running along a shelf of new books to see if there was anything that would suit him, would pass this handsome volume. But he would make a grave mistake. The book is a sort of encyclopædia, crammed with all that two clever men can put into it. The original author, Dr. Parkes, may be regarded as the founder of Hygiene as a science, and has had the rare distinction of a temple being built in his honour—the Parkes Museum (in Margaret Street, Oxford Street, W.) Of the present editor, Dr. De Chaumont, we must not say much, since happily he bids fair to go on benefiting his country for years to come, but he is certainly a worthy successor to Dr. Parkes in the Professorship of Military Hygiene at Netley.

Thus far, however, we have not given evidence in support of our assertion, that the book is one of considerable interest for meteorologists. Chapter XIV. is devoted to "Climate," and occupies 14 pages. Chapter XV. is entitled, "Description of the Meteorological Instruments, and a few notes on Meteorology." This occupies 21 pages, and is extremely good. But besides these chapters and others on Air and on Water, the calculation of averages, the drawing of diagrams, air meters, wells, ventilation, the climate of foreign stations, meteoric and volcanic dust, and a host of other subjects, are discussed at various length in this excellent work, not the least important feature in which is an index of about 3,000 entries.

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## PINK SEMI-CIRCLE OPPOSITE THE SUN.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Backhouse inquires whether the pink semi-circle opposite the sun is of frequent occurrence. I can say nothing as to sunrise, as, being in the town, I have no opportunity of observing, but at sunset they have frequently been seen, notably so on the evenings of the 10th and 11th of this month, when it was unusually brilliant, and with the rising full moon on its southern edge, and Venus shining brightly in the red orange sun-set, the sky presented a glorious sight. The phenomenon has accompanied sunsets of a

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deep orange red and green colour, with a fiery red after-glow for an hour or more after the sun itself had set, but I have never observed it with an ordinary red sunset.

Leaving to others, better able to form an opinion, to say whether Krakatoa or aqueous vapour, is responsible for these unusual sunsets, I will merely observe that they were remarked before Krakatoa was heard of, and that those most brilliant, and leaving an afterglow have been followed by rain or snowstorm of some days duration, so much snow not having been known here within memory, whether in the plain country or in the mountains. The sunsets of the 10th and 11th were followed from midnight of the 11th by almost incessant snow till the morning of the 16th, turning to sleet all that day, with very dark overcast days till the night of the 18th. There was but one break in the clouds during that time, viz., on the afternoon of the 13th, when there was another green and orange sunset with lurid red after-glow.—Truly yours,

M. F. WARD, F.R.A.S.

*Munich, Jan. 29th, 1884.*

[Can Col. Ward oblige us with copies of any printed notices of unusual sunsets, afterglows, &c., published before August 26th?—ED.]

## THE KRAKATOA ERUPTION.

*To the Editor of the Meteorological Magazine.*

SIR,—The Council of the Royal Society has appointed a committee for the purpose of collecting the various accounts of the volcanic eruption at Krakatoa, and attendant phenomena, in such form as shall best provide for their preservation and promote their usefulness.

The Committee invite the communication of authenticated facts respecting the fall of pumice and of dust, the position and extent of floating pumice, the date of exceptional quantities of pumice reaching various shores, observations of unusual disturbances of barometric pressure and of sea level, the presence of sulphurous vapours, the distances at which the explosions were heard, and exceptional effects of light and colour in the atmosphere.

The Committee will be glad to receive also copies of published papers, articles, and letters bearing upon the subject. Correspondents are requested to be very particular in giving the date, exact time (stating whether Greenwich or local), and position whence all recorded facts were observed. The greatest practicable precision in all these respects is essential.

All communications are to be addressed to

Your obedient servant,

G. J. SYMONS.

*Chairman Krakatoa Committee.*

*Royal Society, Burlington House, W.,*
*February 12th, 1884.*

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1883.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | TotalRain. Depth. | TotalRain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 85·6 | 29 | 41·3 | 17 | 71·4 | 50·4 | 49·1 | 70 | 125·5 | 36·8 | 1·35 | 12 | 5·7 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 79·4 | 7 | 59·4 | 11 | 75·8 | 65·2 | 61·2 | 71 | ... | ... | 1·97 | 13 | 4·3 |
| Calcutta | 98·7 | 1 | 73·2 | 5 | 90·8 | 77·7 | 78·0 | 80 | 161·9 | 71·4 | 10·20 | 20 | 8·0 |
| Madras | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bombay | 92·3 | 1 | 73·7 | 7 | 87·0 | 78·1 | 77·4 | 84 | 149·4 | 71·1 | 13·65 | 25 | 8·9 |
| Ceylon, Colombo | 87·8 | 2 | 72·8 | 9 | 85·4 | 76·7 | 73·1 | 77 | 148·0 | ... | 11·71 | 20 | 8·0 |
| *Melbourne* | 65·2 | 15* | 37·3 | 10 | 60·1 | 47·9 | 45·4 | 75 | 117·4 | 31·0 | 1·96 | 11 | 7·3 |
| *Adelaide* | 65·5 | 13 | 44·5 | 28 | 61·6 | 49·4 | 47·5 | 75 | 127·4 | 36·4 | 2·77 | 16 | 6·2 |
| *Wellington* | 63·0 | 25 | 33·5 | 13 | 56·3 | 43·9 | ... | ... | 112·0 | 30·0 | 1·60 | 8 | ... |
| *Auckland* | 62·5 | 22 | 40·0 | 13 | 58·9 | 48·3 | 45·7 | 74 | 130·0 | 35·0 | 3·30 | 15 | 6·1 |
| *Falkland Isles* | 44·9 | 10 | 11·8 | 19 | 40·7 | 32·2 | 35·0 | 95 | 87·6 | 13·6 | 1·73 | 23 | 7·9 |
| Jamaica, Kingston | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Barbados | 83·0 | 27† | 70·0 | 7,8 | 81·0 | 72·0 | 73·6 | 86 | 147·0 | 69·0 | 8·43 | 19 | 6·5 |
| Toronto | 78·9 | 24 | 39·2 | 1 | 71·2 | 52·5 | 56·0 | 77 | 142·0 | 32·4 | 4·96 | 14 | 6·5 |
| New Brunswick, Fredericton | 87·7 | 27 | 40·0 | 2 | 75·2 | 51·1 | 54·0 | 74 | ... | ... | 3·01 | 17 | 6·2 |
| Manitoba, Winnipeg | 94·2 | 27 | 28·0 | 2 | 73·8 | 48·5 | 53·2 | 52 | ... | ... | 3·91 | 10 | 5·2 |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 16. † And 29.

### REMARKS, JUNE, 1883.

*Mauritius.*—Rainfall ·09 in. below the average; mean pressure 30·126 in.; mean hourly velocity of wind 10·8 miles, extremes 29·8 miles and 2·3 miles; prevailing direction S.E.; strong trade wind from 24th to end of month. C. MELDRUM, F.R.S.

CEYLON.—T8S on four days, and L four other days. J. H. SYMONDS.

*Melbourne.*—Mean temp. 4° above the average; temp. of dewpoint and amount of cloud also above the average; humidity, pressure, and rainfall all very slightly below it; prevailing direction of wind N., strong breezes occurring on 9 days; violent gusts from N. on the morning of 22nd; heavy dew on 10th and 11th; heavy T and H storm on 23rd; auroral light seen on 27th. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure 30·136 in., being slightly above the average of 26 years; mean. temp. (55°·5) 1°·9 above the average, and the highest since 1871; mean daily range (12°·2) 1°·6 below the average, and the total range, 21°·0 was the least monthly range on record; amount of cloud below the average; rainfall ·17 in. above it. Although the rainfall at Adelaide was only 2·77 in., yet over the agricultural districts generally it was very heavy; on 21st and 22nd the R was steady and heavy, especially in the Mt. Lofty ranges, where at places upwards of 3 in. fell in 24 hours, and the country was everywhere flooded. C. TODD.

*Wellington.*—Up to the 10th fine with moderate winds, chiefly from S.E.; on night of 10th wind changed to S.W., with H, L, and slight R; a S.W. gale blew on night of 13th, with R and H; from 15th to 23rd generally fine, with frequent strong N.W. wind; heavy R on night of 24th, then fine until 30th. R. B. GORE.

*Auckland.*—Mean pressure slightly below the averge; temp. about the average; rainfall much below it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. (75°·8) (1°·5) below the average of 25 years; prevailing direction of wind N.E.; mean hourly velocity, 15·4 miles, extremes 19·8 miles and 8·9 mies; rainfall 33 per cent., and evaporation 19 per cent., above the average; nine days were overcast; L on 1st, T on 21st. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·60 | XI. | Carno, Tybrith ... ..... | 3·20 |
| ,, | Margate, Birchington... | 1·64 | ,, | Corwen, Rhug ..... | 4·20 |
| ,, | Littlehampton .. ..... | 3·12 | ,, | Port Madoc ..... | ... |
| ,, | Hailsham ..... | ... | ,, | I. of Man, Douglas ..... | 6·85 |
| ,, | I. of W., St. Lawrence. | 3·45 | XII. | Stoneykirk, Ardwell Ho. | 5·76 |
| ,, | Alton, Ashdell..... | 4·49 | ,, | Melrose, Abbey Gate... | 5·52 |
| III. | Winslow, Addington ... | 2·50 | XIII. | N. Esk Res. [Penicuick] | 4·95 |
| ,, | Oxford, Magdalen Col... | 2·30 | XIV. | Ayr, Cassillis House ... | 7·44 |
| ,, | Northampton ..... | 2·22 | ,, | Glasgow, Queen's Park. | 5·55 |
| ,, | Cambridge, Beech Ho... | 1·35 | XV. | Islay, Gruinart School.. | 5·85 |
| IV. | Southend ..... | 1·73 | XVI. | St. Andrews, Newton Bk | 3·78 |
| ,, | Harlow, Sheering ... .. | 2·03 | ,, | Balquhidder, Stronvar.. | 12·73 |
| ,, | Diss ..... | 1·58 | ,, | Dunkeld, Inver Braan.. | 6·51 |
| ,, | Swaffham ..... | 1·92 | ,, | Dalnaspidal H.R.S. ... | 9·45 |
| ,, | Hindringham ..... | 2·18 | XVII. | Keith H.R.S. ..... ..... | 3·20 |
| V. | Salisbury, Alderbury... | 3·54 | ,, | Forres H.R.S. ..... ... | 3·36 |
| ,, | Warminster ..... | 3·77 | XVIII. | Strome Ferry H.R.S.... | 10·17 |
| ,, | Calne, Compton Bassett | 3·34 | ,, | Lochbroom ..... | 11·08 |
| ,, | Ashburton, Holne Vic.. | 9·72 | ,, | Tain, Springfield ..... | 4·05 |
| ,, | Holsworthy, Clawton... | 4·24 | ,, | Loch Shiel, Glenaladale | 18·91 |
| ,, | Lynmouth, Glenthorne. | 6·65 | ,, | Invergarry ..... | 14·32 |
| ,, | Probus, Lamellyn ..... | 4·15 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Wincanton, Stowell Rec. | 3·45 | ,, | Forsinard H.R.S. ..... | 4·53 |
| ,, | Taunton, Fullands ..... | 3·26 | ,, | Watten H.R.S. ..... | 3·65 |
| VI. | Bristol, Clifton ..... .. | 4·82 | XX. | Dunmanway, Coolkelure | 10·59 |
| ,, | Ross ..... | 3·28 | ,, | Fermoy, Gas Works ... | 3·40 |
| ,, | Wem, Sansaw Hall..... | 2·86 | ,, | Tralee, Castlemorris ... | 4·43 |
| ,, | Cheadle, The Heath Ho. | 2·98 | ,, | Tipperary, Henry Street | 4·95 |
| ,, | Worcester, Diglis Lock | 3·02 | ,, | Newcastle West ..... | 5·32 |
| ,, | Coventry, Coundon ..... | 3·26 | ,, | Miltown Malbay..... | 4·70 |
| VII. | Melton, Coston ..... | 2·27 | ,, | Corofin ..... | 5·75 |
| ,, | Ketton Hall [Stamford] | 1·93 | XXI. | Carlow, Browne's Hill.. | 4·16 |
| ,, | Horncastle, Bucknall ... | 2·20 | ,, | Navan, Balrath ..... | 3·37 |
| ,, | Mansfield, St. John's St. | 3·51 | ,, | Mullingar, Belvedere ... | 4·54 |
| VIII. | Macclesfield, The Park. | 4·03 | ,, | Athlone, Twyford ..... | 7·46 |
| ,, | Walton-on-the-Hill..... | 3·59 | XXII. | Galway, Queen's Col.... | 5·41 |
| ,, | Lancaster, South Road. | 5·46 | ,, | Clifden, Kylemore ..... | ... |
| ,, | Broughton-in-Furness .. | 8·19 | ,, | Crossmolina, Ennisçoe.. | 7·85 |
| IX. | Wakefield, Stanley Vic. | 2·81 | ,, | Carrick-on-Shannon ... | 4·08 |
| ,, | Ripon, Mickley ..... | 4·71 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 2·99 | ,, | Rockcorry..... | 5·08 |
| ,, | East Layton [Darlington] | 4·31 | ,, | Warrenpoint ..... | 5·15 |
| ,, | Middleton, Mickleton .. | 7·33 | ,, | Newtownards ..... | 5·14 |
| X. | Haltwhistle, Unthank.. | 6·98 | ,, | Belfast, New Barnsley . | 6·15 |
| ,, | Shap, Copy Hill ..... | 9·68 | ,, | Cushendun ..... | 7·24 |
| XI, | Llanfrechfa Grange .'... | 6·65 | ,, | Bushmills ..... ..... | 5·17 |
| ,, | Llandovery ..... | 8·38 | ,, | Stewartstown ..... | 6·02 |
| ,, | Solva ..... | 3·12 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 5·08 | ,, | Buncrana ..... | 5·55 |
| ,, | Rhayader, Nantgwillt.. | 9·41 | ,, | Carndonagh ..... | 5·01 |

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# JANUARY, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date | No. of Nights below 32°. In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·30 | — ·05 | ·55 | 26 | 16 | 55·6 | 29 | 32·2 | 1 | 0 | 8 |
| II. | | Maidstone (Hunton Court)... | 2·33 | — ·24 | ·70 | 25 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 2·83 | + ·28 | ·80 | 26 | 19 | 56·3 | 30 | 30·2 | 1 | 1 | 13 |
| III. | | Hitchin ..... | 2·14 | — ·08 | ·62 | 26 | 16 | 52·0 | 23*b* | 29·0 | 28 | 6 | ... |
| ,, | | Banbury ..... | 2·75 | + ·37 | ·55 | 26 | 19 | 54·0 | 23*c* | 29·5 | 28 | 5 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·84 | ·00 | ·47 | 26 | 17 | 58·0 | 23 | 29·0 | 1 | 7 | ... |
| ,, | | Norwich (Cossey) ..... | 1·37 | — ·33 | ·23 | 26 | 14 | 56·0 | 30 | 31·0 | 19 | 1 | 8 |
| V. | | Weymouth(LangtonHerring) | 3·31 | ... | ·63 | 26 | 19 | 52·0 | 29*b* | 32·0 | 1, 27 | 2 | ... |
| ,, | | Barnstaple..... | 4·63 | + ·37 | ·75 | 25 | 19 | 56·0 | 5 | 35·0 | 1, 2 | 0 | ... |
| ,, | | Bodmin ..... | 5·07 | — 1·44 | ·75 | 26 | 23 | 53·0 | 4*d* | 33·0 | 27 | 0 | 4 |
| VI. | | Cirencester ..... | 3·79 | + ·41 | ·55 | 23 | 19 | .. | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·20 | — ·23 | ·53 | 26 | 18 | 52·0 | 29 | 29·0 | 2 | 6 | 6 |
| ,, | | Tenbury (Orleton) ..... | 3·28 | + ·29 | ·66 | 26 | 17 | 55·8 | 22 | 30·0 | 29 | 2 | 6 |
| VII. | | Leicester ... ..... | 2·14 | ... | ·30 | 23 | 19 | 54·2 | 24 | 30·6 | 27 | 1 | 2 |
| ,, | | Boston ..... | 1·90 | + ·18 | ·34 | 3 | 10 | 54·0 | 23 | 33·0 | 26 | 0 | ... |
| ,, | | Grimsby (Killingholme)..... | 2·76 | + 1·00 | ·64 | 23 | 19 | 53·0 | 22*e* | 32·0 | 28 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 2·90 | ... | ·48 | 23 | 18 | 55·0 | 22 | 32·0 | 2 | 4 | ... |
| VIII. | | Manchester (Ardwick)..... | 4·43 | + 1·19 | ·62 | 25 | 20 | 52·0 | 9*f* | 31·0 | 28 | 5 | ... |
| IX. | | Wetherby (Ribston Hall) .. | 3·42 | + 1·20 | ·74 | 3 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 11·57 | + 4·64 | 2·55 | 22 | 27 | 51·0 | 9, 22 | 33·0 | 2 | 0 | ... |
| X. | | North Shields ..... | 2·93 | + 1·09 | ·57 | 3 | 19 | 55·5 | 9 | 29·0 | 29 | 8 | 9 |
| ,, | | Borrowdale (Seathwaite)..... | 22·51 | + 3·76 | 4·07 | 22 | 29 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 6·35 | + 1·64 | 1·06 | 31 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 5·76 | — ·51 | 1·00 | 2 | 26 | 53·5 | 23 | 31·9 | 26 | 1 | 2 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 6·88 | ... | 1·62 | 22 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 4·52 | + 1·56 | ·88 | 22 | 19 | 54·0 | 5 | 32·2 | 2 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 8·41 | + 2·30 | 1·21 | 26 | 23 | 51·8 | 9 | 26·6 | 3 | 4 | ... |
| ,, | | Hawick ..... .. ..... | 6·05 | + 2·83 | ·71 | 23 | 22 | ... | ... | .. | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 8·72 | + 3·28 | 1·15 | 29 | 22 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 10·40 | + 2·53 | 1·69 | 26 | 28 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 7·56 | ... | ·99 | 24 | 29 | 52·0 | 19 | 29·7 | 26 | 3 | ... |
| ,, | | Mull (Quinish)..... | 7·51 | ... | ·71 | 22 | 26 | ... | ... | ... | .. | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 5·60 | + 1·78 | ·90 | 5, 25 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 3·06 | + ·61 | ·55 | 4 | 16 | 50·0 | 9 | 26·0 | 3, 26 | 7 | ... |
| XVII. | | Braemar ..... .. | 4·80 | + 2·02 | ·97 | 4 | 22 | 50·0 | 21*f* | 14·3 | 3 | 14 | 27 |
| ,, | | Aberdeen ..... ..... | 3·02 | ... | ·87 | 23 | 17 | 55·0 | 15 | 25·0 | 26 | 11 | ... |
| XVIII | | Skye (Sligachan) ..... | 16·37 | ... | 3·00 | 20*a* | 26 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... ..... | 3·74 | + 1·97 | ... | ... | ... | 52·0 | 5 | 26·0 | 1 | 10 | 21 |
| XIX. | | Dunrobin ..... ..... | 4·73 | ... | ·84 | 23 | 28 | 56·0 | 21 | 25·5 | 26 | 5 | ... |
| ,, | | Orkney (Sandwick)..... .. | ... | ... | ... | ... | ... | .. | ... | ... | ... | ... | ... |
| XX. | IRELAND. | Cork (Blackrock) ..... | 6·85 | + ·83 | 1·08 | 2 | 19 | 56·0 | 29 | 30·0 | 26 | 1 | .. |
| ,, | | Dromore Castle ..... | 9·15 | ... | 1·44 | 22 | 23 | 57·0 | 22 | 32·0 | 25*g* | 3 | ... |
| ,, | | Waterford (Brook Lodge) ... | 5·11 | ... | ·78 | 2 | 20 | 55·0 | 22 | 29·0 | 27 | 3 | 6 |
| ,, | | Killaloe ..... | 6·07 | ... | ·82 | 25 | 25 | 54·0 | var. | 30·0 | 27 | 2 | ... |
| XXI. | | Portarlington ..... ..... | 3·30 | + ·24 | ·62 | 22 | 21 | 55·0 | 22 | 32·0 | 27 | 2 | ... |
| ,, | | Dublin (FitzWilliam Square) | 2·36 | + ·10 | ·38 | 22 | 18 | 55·8 | 29 | 31·2 | 27 | 4 | 6 |
| XXII. | | Ballinasloe ..... ..... | 5·40 | + 1·04 | ·95 | 22 | 29 | 51·0 | 4 | 26·0 | 27 | 4 | ... |
| XXIII | | Waringstown ..... | 4·65 | + 1·24 | ·75 | 22 | 24 | 55·0 | 9, 22 | 28·0 | 25 | 6 | 12 |
| ,, | | Londonderry (Creggan Res.). | 6·31 | ... | ·74 | 3 | 27 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 5·70 | + 1·93 | ·76 | 22 | 27 | 59·0 | 14 | 23·0 | 25 | 13 | ... |

+ Shows that the fall was above the average; — that it was below it.

*a* And 24. *b* And 30. *c* And 24. *d* And 23, 29. *e* And 23. *f* And 22. *g* And 26, 27.

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# METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The weather was very rough towards the close of the month, and the temp. rather lower than it had been in the earlier part; heavy gales occurred from S.W. on 20th and 26th, during which much R fell; some serious damage was done by the force of the wind, some firs nearly 90 ft high being snapped off about 8 ft. from the ground; T S S of great violence, accompanied by H, occurred on the 25th and 26th.

HITCHIN.—Terrific gale on 26th; bar. reading 28·32 in.

BANBURY.—A remarkable month, mean temp. 43°·5, about 8° above the average; the first week was rather wet, the second and third weeks were very fine with high barometric pressure; the rest of the month was stormy, especially from 25th to 28th, the bar. on 26th falling to 28·423 in. (cor. and red.) at 6.30 p.m., with tremendous wind, doing much mischief; S on 1st and 27th; H on 1st, 11th and 25th; high wind on 11 days, fog on four days.

CULFORD.—The month was remarkable for high winds, but was very mild and open; very stormy with L on 26th.

COSSEY.—Gale on 26th, with R, H and L.

LANGTON HERRING.—A very mild month, the temp. falling to 32° on only two occasions; the first 10 days were unsettled, R falling each day, succeeded by 10 very fine dry days, with remarkably steady pressure and the air perfectly calm; a violent storm was experienced on 26th and 27th, with T and L; mean temp. of the month 44°·0, 4°·5 above the average of 12 years.

BODMIN.—Very heavy gales occurred on the 23rd, 25th, 26th and 27th, but little damage was sustained in this neighbourhood; mean temp. 45°·9; L on 26th and 27th.

WOOLSTASTON.—A slight fall of S on the 1st was followed by three weeks of beautiful mild and open weather; a series of gales commencing on the 22nd culminated in one of extreme violence on 26th; the bar. at its lowest at 5.30 p.m. on that day, after which it slowly rose; mean temp. of the month 42°·1.

ORLETON.—The temp. was very high and steady during the whole of the month, the mean being 6°·5 above the average of 23 years; light falls of R occurred on six out of the first seven days, which were generally cloudy and damp; after this R fell on only one day till the 22nd, and the weather was generally cloudy and dry, and the bar. very high and steady. The remainder of the month was very stormy and rainy; bar. lowest at 6 p.m. on 26th, accompanied by a great storm of wind and R which flooded the river Teme on the following morning.

LEICESTER.—Another very mild month and very dry from 9th to 21st; on 24th, and 26th, the wind was very high, and the the bar. on the latter day fell to 28·427 in. (corrected) flashes of L were seen on the evenings of 15th, 26th, and 27th.

BOSTON.—Very heavy gales from 20th to 27th; on 26th the force of the wind amounted to a mild hurricane; a small fall of S on 27th

GRIMSBY, KILLINGHOLME.—A very mild month, winds light in the early part but very high on several occasions in the latter part; gale on 23rd, great gale on 26th with T and L.

HESLEY HALL [TICKHILL].—Mild weather prevailed throughout the month generally, but from the 22nd to the end south-westerly gales with much R brought colder weather, and caused great damage to trees.

ARNCLIFFE.—A very wild rainy month, the fall of 2·55 in. on 22nd is most unusual.

NORTH SHIELDS.—Very stormy on 26th with L; at 10 p.m. the bar. stood at 27·90 in, and continued to fall till it reached 27·63 in., it then rose, and at

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2 a.m. on 27th stood at 28·00 in. It seems that there was a more violent gale in January 1839, but during 44 years the bar. never fell so low.

SEATHWAITE.—Falls of R exceeding one inch in 24 hours occurred on 11 days during the month, and on the three days 21—23, 7·41 in. fell causing a great flood; gales also did much damage; on 23rd about 5 p.m. it blew with such force that walking was quite a difficulty, and another terrific gale blew on the 26th.

## WALES.

HAVERFORDWEST.—This January was characterized by entire absence of frost, great gloom and damp and remarkable calmness of the atmosphere with very high bar. (30·705 in. cor. on 15th) until the memorably stormy period which began on the night of 21st; it was exceedingly wild all day on 23rd; ominously calm on 24th; very stormy all day with H, L and R and tempest at night on 25th, culminating in the great storm of Saturday the 26th. Pressure at 9 a.m. on 26th, 28·958 in. (cor.) noon 28·731 in., 5 p.m. 28·418 in. the lowest point observed, and at 11 p.m., 28·634 in. R and gloom prevailed to the end of the month.

LLANDUDNO.—The month was exceptionally mild and equable as regards temp., the mean being more than 4° above the average and the range both diurnal and monthly markedly below it; the R, however, was excessive. There was a terrific gale of wind from S.W., on the afternoon of the 26th, at its worst about 3·30 p.m.; the dome of the Grand Pavilion which was just completed sustained serious damage.

## SCOTLAND.

CARGEN.—A very stormy, wet, dull month, mean temp. (42°·6) nearly 4°·5 above the average; rainfall more than one-third above the average, and sunshine not much more than half the usual amount; a very heavy gale was experienced on the 23rd, and did considerable damage; it lasted from four to five hours; the gale of 26th was one of extreme violence, and lasted 14 hours, and was most disastrous in its effects; from reports from the district it appears to have caused more destruction than the storm of 11th—12th Dec., 1883; on one large estate in the district it is estimated that upwards of 1,000,000 trees have been blown down by these storms, the bar. on 26th fell to the exceedingly low point of 27·660 in. which is ·480 in. below the lowest point recorded during the previous 24 years.

HAWICK.—Very stormy weather on 3rd, 21st, 26th, 27th and 29th, much L on the nights of 20th and 29th; mild from 5th up to 20th; the storm of the 26th was the most severe we have had since the Tay Bridge disaster.

ORAN, CRAIGVARREN.—Rainfall unusually large, and on no less than 19 days there were heavy gales; the temp. was on the whole high, but the range was considerable; on the 26th a terrific gale occurred from S.W., the tide rose two feet above ordinary springs, and the bar. at 9 p.m. stood at 27·39 in.

BRAEMAR.—An usually fine month up to the 22nd; primroses in flower, and rose bushes and honeysuckle budding; on 26th at 9 p.m. the bar. read 26·350 in. (1,114 ft. above sea level), the lowest reading by an inch recorded during 27 years.

ABERDEEN.—Rainfall somewhat above the average; fair seasonable weather prevailed during the greater portion of the month till the 23rd, when a heavy rainfall occurred, succeeded by violent gales on 26th and 27th; at midnight on 26th, the bar reached the lowest point ever recorded here—viz., 27·40 in. (cor. and red.)

SLIGACHAN.—The first three days of the month were very fine; the rest of the month was very stormy; terrible gales from S.W. veering to N.W. blew on the nights of 19th and 21st, and a heavy fall of S occurred on 26th, with high wind from N.W., veering to S.W.; it was the wildest day I ever experi-

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enced, a great number of sheep were lost throughout the island buried in the snowdrift.

CULLODEN.—The first and second weeks were very fine, from the 6th to 20th particularly so; the 26th and 27th will be long remembered, a storm of S with tremendous drifts visiting the north, and indeed Scotland generally; the bar. fell to a point lower than any observed during many years, the lowest reading being at 11 p.m. on 26th, 27·386 in.

## IRELAND.

BLACKROCK.—Temp. generally high in the first part of the month, but it changed colder about the 21st, followed by storms on 23rd and on 26th, with violent R (·735 in., nearly all in one hour) and T; part of the dome of the observatory was blown off and carried many yards away; the bar. fell to 28·53 in. at noon on the 26th.

WATERFORD.—Rainfall one inch above the average; the early part of the month was very mild, primroses in bloom and woodbine in leaf; from the 21st to the end of the month was very wild and wet; S fell on three days; H on 1st and 23rd, and L was seen on 21st and 25th.

KILLALOE.—Very mild open weather prevailed, with average rainfall, until the 17th, after which date it blew heavily at intervals, rising to a very severe gale on the 26th, followed by a fall of S; some T and L on days preceding the storm.

DUBLIN, FITZWILLIAM SQUARE.—A singularly open frostless month, with scarcely any easterly wind, but a great excess of cloud; a protracted mild, quiet, and dull period was succeeded on the 22nd by a series of strong westerly gales and frequent heavy rainfalls, the atmospheric disturbances culminating on the 26th in a storm of exceptional violence; at 2.15 p.m. the bar. stood at 28·150 in. The mean temp. (45°·2) was slightly over 4° in excess of the average, and the rainfall and rainy days were both also above the average; H occurred on 1st and 30th; S or sleet on 25th, 26th, and 27th; L was seen on the nights of 20th and 25th.

BALLINASLOE.—Generally very wet, with unusually high temp., there being only four days frost in the month; violent gales on 22nd and 26th.

WARINGSTOWN.—The beginning of the month was wet, followed by a fortnight of fine dry weather, on the breaking up of which we experienced two of the most severe gales I have witnessed; that of the 26th was awful, and the damage done equals that of January 6th-7th, 1839; the bar. fell to 27·556 in., much the lowest point touched since I have kept a record.

LONDONDERRY, CREGGAN RES.—The month was very stormy; especially severe westerly gales blowing on the 23rd and 26th.

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## WIND PRESSURE AT THE FORTH BRIDGE.

During the storm of the 12th of last month (December, 1883), which seems to have been general in its violence all over the country, the pressures of wind recorded on the boards erected by Mr. Baker were—on the small board, about 1·5 ft. square, 38·5 lbs. per square foot; on the large board, having an area of 300 square feet, the pressure recorded was 21·5 lbs. per foot. At Wexford, at the same time, the maximum pressure recorded on a board abont 2 ft. square was 28 lbs.—*The Engineer*, Jan. 4, 1884. Vol. lvii. p. 12.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXVIII.] MARCH, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## In Memoriam.

**PROF. ARNOLD GUYOT,**
BORN SEPT. 28TH, 1807.
DIED FEB. 8TH, 1884.

**CAPT. N. H. C. HOFFMEYER,**
BORN JUNE 3RD, 1836.
DIED FEB. 16TH, 1884.

EMINENT Meteorologists not unfrequently depart in couples. It was so with Charles St. Claire De Ville and Jelinek, and now, within little more than a week we have lost in Guyot the author of *Earth and Man*, a work which as an introduction to Physical Geography is almost unequalled, and whence hundreds of thousands of his fellow-men have imbibed correct views of the world they inhabit; and also the compiler of *Tables Meteorological and Physical*, a work with which scarcely any working meteorologist can dispense.

Captain Hoffmeyer will long be remembered for work in a very different department of meteorology, notably for his great and self-denying labours in giving us daily charts of Atlantic weather. Scientific facts once honestly ascertained and printed and distributed over the world, can scarcely be lost while the world itself remains, hence the truth of Lord Derby's remark that the victories of science are not for one time or one place, but for all times and all places, and hence it is that long after our friend's remains have returned to their original state, his *Cartes synoptiques* will continue available, and future generations will honour his industry, though they will know nothing of the agreeable personal character so sadly missed by his many friends.



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## ANOTHER SOURCE OF VOLCANIC DUST.

WE have in previous issues referred to the excellent weekly, published at Cambridge, Massachussets, entitled *Science*. The number for February 15th, just received, contains a very important and interesting paper by Mr. G. Davidson, communicated by Prof. Hilgard, Superintendent of the United States Coast and Geodetic Survey.

The record is so similar to that of the Krakatoa eruption that but for the facts bearing the indisputable *imprimatur* of Prof. Hilgard, and that some accounts have already been published by the United States Signal Service, one would almost suspect some colouring, or even a hoax. From its origin, however, it is certain that it is absolutely true.

The account, as given in *Science*, is illustrated by a large map of Alaska and the adjacent regions, and also by a view of the island concerned; this we have reproduced, but we do not give the map, partly because of the cost, partly because it would delay this article, and partly because any good map of the extreme north-west of America will show Cook's Inlet, in lon. 152° W. and lat. 60° N. and Augustin Island lies in the mouth of the inlet.

The narrative is not very compactly written, and our first intention was to recast it in a systematic form, but of course retaining the very expressions used by Mr. Davidson. We have, however, eventually decided on reprinting it *verb. et lit.*, and, having regard to its importance, we suspend our ordinary custom of using small type for reprints, and give it all the prominence of an original communication:—

"NOTES ON THE VOLCANIC ERUPTION OF MOUNT ST. AUGUSTIN, ALASKA, OCT. 6, 1883.

"ON the western side of the entrance to Cook's Inlet (forty-five miles wide) lies Cape Douglas; and to the northward of the cape the shore recedes over twenty miles, forming the Bay of Kamishak. In the northern part of this bay lies the Island of Chernaboura ('black-brown'), otherwise called Augustin Island. It is eight or nine miles in diameter, and near its north-eastern part rises to a peak called by Cook, Mount St. Augustin. As laid down by Tebenkoff, the island is nearly round. The northern shores are high, rocky, and forbidding, and are bordered by vast numbers of rocks and hidden dangers. The southern shore is comparatively low.

"Mount St. Augustin was discovered and named by Capt. Cook, May 26, 1778; and he describes it as having 'a conical figure, and of very considerable height.' In 1794 Puget describes it as—

"A very remarkable mountain, rising with a uniform ascent from the shores to its lofty summit, which is nearly perpendicular to the centre of the island, inclining somewhat to its eastern side . . . . Towards the seaside it is very low, from whence it rises, though regular, with a rather steep ascent, and forms a lofty uniform, and conical mountain, presenting nearly the same appearance from every point of view, and clothed with snow and ice, through which

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neither tree nor shrub were seen to protrude; so that, if it did produce any, they must either have been very small, or the snow must have been sufficiently deep to have concealed them."

"At that time there were native hunters, under the direction of two Russians, hunting or living in the vicinity of the north-eastern point of the island.

"Vancouver placed the peak of this mountain in latitude 59° 22′: Tebenkoff places it in latitude 59° 24′.

"The peak of St. Augustin is distant forty-nine miles nearly due west (true) from the settlement on the southern point of Port Graham, or, as it is sometimes called, English Harbor. This harbor is situated is situated on the eastern side of Cook's Inlet, near Cape Elizabeth.

"In connection with the fall of pumice-dust at Iliuliuk* on Oct. 16, 1883, it may be of interest to observe, that the peak of Augustin is over seven hundred miles to the north-eastward of Bogosloff Island, off Unalashka.

"About eight o'clock on the morning of Oct. 6, 1883, the weather being beautifully clear, the wind light from the south-westward (compass), and the tide at dead low water, the settlers and fishing-parties at English Harbor heard a heavy report to windward (Augustin bearing south-west by west three-fourths west by compass). So clear was the atmosphere that the opposite or north-western coast of the inlet was in clear view at a distance of more than sixty miles.

"When the heavy explosion was heard, vast and dense volumes of smoke were seen rolling out of the summit of St. Augustin, and moving to the north-eastward (or up the inlet) under the influence of the lower stratum of wind; and, at the same time (according to the statements of a hunting-party of natives in Kamishak Bay), a column of white vapor arose from the sea near the island, slowly ascending, and gradually blending with the clouds. The sea was also greatly agitated and boiling, making it impossible for boats to land upon or to leave the island.

"From English Harbor (Port Graham) it was noticed that the columns of smoke, as they gradually rose, spread over the visible heavens, and obscured the sky, doubtless under the influence of a higher current (probably north or north-east). Fine pumice-dust soon began to fall, but gently, some of it being very fine, and some very soft, without grit.

"At about twenty-five minutes past eight a.m., or twenty-five minutes after the great eruption, a great 'earthquake wave,' estimated as from twenty-five to thirty feet high, came upon Port Graham like a wall of water. It carried off all the fishing-boats from the point, and deluged the houses. This was followed, at intervals of about five minutes, by two other large waves, estimated at eighteen and fifteen feet; and during the day several large and irregular waves came into

* Lat. 53° 52′N., Lon. 166° 32′W.—Ed. *M.M.*



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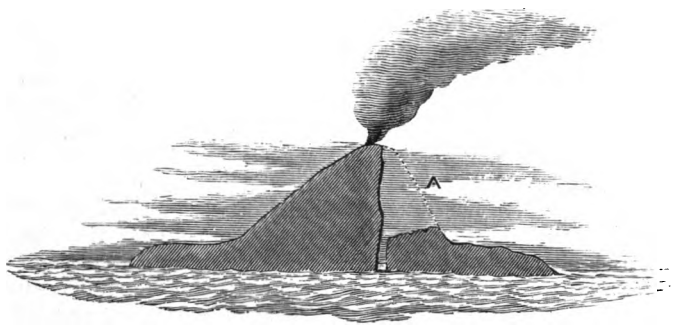
the harbor. The first wave took all the boats into the harbor, the receding wave swept them back again to the inlet, and they were finally stranded. Fortunately it was low water, or all of the people at the settlement must inevitably have been lost. The tides rise and fall about fourteen feet.

"These earthquake waves were felt at Kadiak,* and are doubtless recorded on the register of the coast-survey tide-gauge at that place. Also the pumice-ashes fell to the depth of four or five inches, and a specimen of the deposit was given to the tidal observer at St. Paul. It will be interesting to compare these ashes with those collected at Iliuliuk on the 16th of October, and which, from a confusion of dates, were supposed to have come from the new Bogosloff volcanic island. I am of the opinion that they came from St. Augustin.

"The condition of the Island of Augustin or Chernaboura, according to the latest accounts, is this:—

"At night, from a distance of fifty or sixty miles, flames can be seen issuing from the summit of the volcano; and in the day-time vast volumes of smoke roll from it. Upon nearer approach from English Harbor, it was found that the mountain had been split in two from peak to base by a great rupture extending across it from east to west, and that the northern slope of the mountain had sunk away to the level of the northern cliff.† This is corroborated by the statement of the hunting party in Kamishak Bay. Smoke issued from the peak at a very short distance to the southward of the rupture.




"The party of natives on Kamishak did not approach the islet, though they gave clear and distinct accounts of its eruption and subsequent appearance; but Capt. C. T. Sands, who was at English Harbor, gave the Alaska company a full description; and Capt. Cullie of the Kodiak states, that, if there were plenty of water in the line of rupture, it would be possible for a vessel to sail through (see figure). At the time of Capt. Sand's observations the low ground of the island was visible, and seemed to be a vast crater, from which smoke and flames were issuing.

* Lat. 58°N., Lon. 152°W. † Capt. Cullie's account.

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"But beyond all these phenomena, apart from the volcanic eruption and the rupture of the island, we have the report of Capt. Cullie of the schooner Kodiak (from whom we also obtain a statement in regard to the rupture), who approached the island from English Harbor on the 10th of November, and found that a new island, about a mile and a half long and seventy-five feet high, had been upheaved in the ten-fathom passage between Augustin and the mainland to the westward. This passage is from six to eight miles wide, and was sailed through by Puget in Vancouver's voyages of discovery.

"This new island (also reported by the hunting-party in Kamishak) would appear to have arisen during the late volcanic activity. It lies to the north-westward of Chernaboura Island (Augustin), and was distinctly seen from the Kodiak, as that vessel lay ten miles to the north-eastward, and had clear weather.

"To show the violence of the volcanic convulsions at this time, two extinct volcanoes on the Alaska peninsula, which are reported to be about west (true) from the active volcano Iliamna (twelve thousand feet high), had burst into activity; and during the day volumes of smoke were distinctly seen, and columns of flame at night. Usually, at that season, Augustin and the peak are covered with deep snow. On the 10th of November, however, when Capt. Cullie approached the island, while there was a depth of four feet of snow at Port Graham (English Harbor), Mount St. Augustin was bare and black.

"During this same season, a party of seven or eight Aleuts had established themselves on Chernaboura (Augustin) Island to hunt the otter during the winter. Two of the women refused to remain on account of the violent noises inside St. Mount Augustin; and they were taken to St. Paul, Kadiak. Since the eruption no one of this party has been seen, nor any signs of their bidarkas, although a rescuing party of natives had gone along the coast to learn of their whereabouts. It is feared, therefore, that they have been destroyed. In confirmation of this report of the native women, Capt. Sands says that he and others noticed that St. Augustin was emitting smoke as far back as August; but no other signs were observed before the heavy report of Oct. 6.

GEORGE DAVIDSON,
*Assistant U. S. Coast and Geodetic Survey.*

## EXTRAORDINARY PHENOMENON ON THE DEE.

**ON Thursday, 21st February, 1884, a most remarkable occurrence took place in the Dee at Connah's Quay, near Chester. The tide flowed at 6.40 a.m., and after two hours' ebb it began to flow again at 8.30, and rose to a height of three feet, when at 9.30 a.m. it ebbed again. Pilots depending upon the tide to come up the river were exceedingly puzzled. So remarkable an event is not remembered among local shipping men.—*Hereford Times.***

## RAINFALL AT THE WETTEST KNOWN STATION.

**THE rainfall at Cherrapunji last year (1883) was 355·25 inches, as compared with 389·82 inches during the year 1882.—*The Colonies.***

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## THE SUNSETS AND THE JAVA EARTHQUAKE.

*To the Editor of the Meteorological Magazine.*

SIR,—I found the *Meteorological Magazine* on my return from a delightful walk in the Tyrol over some five feet of hard snow, and hasten to reply to your note appended to my letter.

These sunsets have from time to time been noticed in the local papers, but I have never cut any of them out, being simply a line or two describing what one had seen one self. They first attracted my notice and that of others on the 9th of May, and being unusual, I noted them in my daily weather diary, and enclose the extracts just as I noted them, if they will be of any use.

A navy officer, who passed through Partenkirchen early in August, told me he had noticed them in the Engadine, and that they were much what they saw in northern latitudes, and were considered generally as forerunners of increased cold and bad weather. With the exception of the sunrise of 1st December, when everyone thought Munich was on fire two hours before sunrise, I never saw anything to equal the sunset of Feb. 7th, and sunrise of the 8th, at the Walchensee, the sunset being over the mountains, and the sunrise over the lake. But for the sunset of the previous evening, I should have said the sunrise betokened bad weather. The following day, as my son and I were walking over the pass to Innsbruck, the sun was most extraordinary, with its rings of blue immediately round it, and then the copper band of about 45° diameter, the outer edge shading down to the blue sky, which, though cloudless, almost was milky. Nothing resulted, the weather continuing fine and frosty till Sunday last, 24th, when we had again an orange sunset and glow; and it has snowed, more or less, ever since Monday morning till now (Thursday). My son's remark on the sun on the 9th, was that it was a "sunset all day." At the Walchensee, the people told me that the sunrises and sunsets had continued ever since the summer, and they had never known so much snow. The old man, whose business it is here to look after the ice on the lake, said to me last week that he hadn't known so much snow and so little skating for 47 years; and at Partenkirchen, though there was so much snow on the mountains all the summer, they never were so bare of snow as at the end of August. I was on the Zug-spitz on that day, and there was literally bare rock to the summit, the glacier itself being bare of snow in many places, but it had been a glorious month.

Sincerely yours,

M. F. WARD.

*20, Hess Strasse, Munich, 28th Feb., 1884.*

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## NOTES COPIED FROM MY DAILY WEATHER ACCOUNT.

1883.

May 9. Unusual sunset glow.
11. Unusually brilliant sunset.
18. Very fine sunset and afterglow.
June 7. Brilliant sunset and glow.
12. Red sunrise.
15. Brilliant sunrise and glow, and orange sunset; 11 p.m., dry bulb 60°, wet 55°, unusually warm for that hour.
20. Brilliant solar halo and evening glow; treble rainbow.
27. Red clouds in E. and S.E. at sunset.

July 20. Brilliant mountain glow after 4 hours' rain.
21. Brilliant red sunrise; mountains fiery red 4 a.m.; double rainbow; cone of light like tail of comet in S.E. an hour or so before moonrise; disappeared in a quarter of an hour. or so.
30. Brilliant mountain glow and sunset.

Aug. 16. Brilliant sunset and afterglow; cone before moonrise as on 21st July.

N.B.—Capt. Noble and others saw cone over moon before rising on the 28th and 29th; here it was cloudless, and moon rose perfectly clear on those evenings.

1884. Since 11th January there have been—

Jan. 19. Fine red sunset, no afterglow.
27-28. Brilliant orange sunsets.
Feb. 7. Gorgeous red sunset } I was on the mountain about 3,000
8. ,, ,, sunrise } feet above sea.
9. Sun surrounded all day by a large copper-coloured band; blue immediately round sun; sky milky. (About 4,000 feet above sea.)

May 10-12. Snow, strong wind; snow down to plain.
16-17. Series of thunderstorms.
19-20. Snow, strong wind; snow nearly down to plain.
June 8-11. Incessant thunderstorm, with heavy rain; snow on mountains.
12. Heavy rain 4 p.m. till 4.30 on 13th; 24 hours' rain 1·77 inches.
16-19. Incessant heavy rain; floods.
21. Violent thunderstorms; heavy rain and snow on mountains; hail; thunderstorm 9.45–12 (·70 in. fell in 25 min.)
27. Very fine weather till 13th July, with usual daily thunderstorms.
July 21. Heavy rain, 5.10 a.m.
22-25. Incessant thunderstorms; snow very low down on mountains.
31. Rain; snow on mountains.

Aug. 17. Snow; rain; then almost cloudless to end of month. All these sunsets were orange, red and green; I never saw green or blue sun or moon.

Jan. 17-23. Clear frost.
28 & 29. Snow; strong wind; hail.
Feb. 2-11. Clear weather.

A blunt cone of white light, something similar to the zodiacal light in direction and form, has been very conspicuous on all clear evenings, an hour or so before sunset, more so when the body of the sun is behind a chimney stack or other object.

*Fresh snow.*—June, 4 days; July, 8; August, 2; Sept., 6; Oct., 11; Nov., 7; Dec., 13; Jan., 9; Feb., 4; total, 64.

*Rain.*—June, 20 days, 14 thunderstorms; July, 17, all thunderstorms; August, 8, ditto; Sept., 15, 4 days thunderstorms; Oct., 9; Nov., 9; Dec. 5; Jan., 8; Feb. 3; total, 94.

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[Having no desire for the attainment of anything except the truth, we print Col. Ward's letter and extracts in full, though they are *not what we asked for*. A meteorological register whence one could extract no records of fine sunsets, and specially a register kept amid snow-covered mountains, would be a strange one. We asked for "any printed notices of unusual sunsets, afterglows, &c., published before August 26th," but we have not yet received even one.—ED.]

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*To the Editor of the Meteorological Magazine.*

SIR,—In consequence of what has appeared respecting the presence of iron in the atmosphere, I have been induced, several times since the commencement of the year, to examine the sediment at the bottom of my gauges, and have, in every case, found iron. It seems to be decreasing in quantity, but even this morning I detected its presence.

I think it would be well if observers would examine, and if able to do so analyze, the sediment that they may find in their gauges. It is possible that substances may float in the atmosphere, the existence of which has never been suspected.—Yours respectfully,

S. KING.

*Elswick Lodge, Great Eccleston, Garstang, March 5th.*

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## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 20th ult., Mr. R. H. Scott, M.A., F.R.S., President, in the chair. T. G. Benn, Capt. C. F. Cooke, Francis Galton, M.A., F.R.S., Prof. S. A. Hill, B.Sc., Capt. A. W. Jeffrey, G. Paul, F.G.S., F.R.H.S., R. Veevers, H. T. Wakelam, and E. Wells were balloted for and elected Fellows of the Society. The following papers were read:—

(1.) "The Great Storm of January 26th, 1884," by William Marriott, F.R. Met. Soc. This storm was remarkable for its violence and large area, as well as for the unprecedentedly low barometer reading at its centre. The author had prepared isobaric charts for each hour from noon on the 26th to 3 a.m. on the 27th, and by this means was able to track the storm across the British Isles. The centre of the depression appeared to have first reached the north-west coast of Ireland at noon, and passed in a north-easterly direction over the north of Ireland and across the middle of Scotland, reaching Aberdeen about midnight. Its rate of progress was therefore about 30 miles an hour. A violent gale was experienced all over the British Isles, the greatest hourly velocity of the wind being 68 miles at Valencia at 11 a.m., 70 miles at Holyhead at 2 p.m., 63 miles at Falmouth at 3 p.m., 69 miles at Armagh, and 59 miles at Aberdeen at 5 p.m., 58 miles at Greenwich from 5 to 7 p.m., and 76 miles at Alnwick at

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midnight. Thunderstorms occurred on the south-eastern side of the depression, and travelled across the south of Ireland and England at the rate of about 30 miles an hour. The lowest readings of the barometer (reduced to sea level) yet reported were 27·26 ins.* at Kilcreggan at 8.30 p.m., and 27·332 ins. at Ochtertyre, near Crieff, at 9.45 p.m. In the southern part of England, directly after the minimum had occurred, there was a very sudden rise in the reading of the barometer, in some cases amounting to 0·08 inch in five minutes. From an examination of previous records it appears that there has never before been so low a barometer reading as 27·26 ins., so that this storm may be considered as one of the most remarkable that has occurred in the British Islands.

(2.) "The Height of the Neutral Plane of Pressure and Depth of Monsoon Currents in India," by Prof. E. D. Archibald, M.A., F.R. Met. Soc.

(3.) "The Sunrises and Sunsets of November and December, 1883, and January, 1884," by Hon. F. A. Rollo Russell, M.A., F.R.Met.Soc. The author gives a very interesting account of all the special features of the remarkable sunrises and sunsets which have been observed from November 8th to February 2nd. The following are stated to be the marks distinguishing the peculiar sky-haze from cirrus :—

1. It is commonly much more evenly spread over the sky than cirrus. 2. It is visible (except when very dense or in the neighbourhood of the sun) only about the time of sunrise and sunset. During the day not the faintest trace obscures the clear azure, whereas cirrus becomes more distinct with more daylight. 3. When actually glowing with bright colour it loses its wavy appearance. 4. It has no perceptible motion, unless perhaps when watched through a long period. 5. It does not interfere with the clear definition of the moon, or brilliancy of the stars. 6. It lies almost without exception in long streaks, stretching from between south-south-west and west-south-west to between north-north-east and east-north-east. 7. Its radiant point lies not on the horizon, but far below it. 8. If both cirrus and sky-haze be present, the sky-haze begins to shine with a red light soon after the cirrus has ceased to glow above the western horizon. When cirrus is present, however, there is in general a reaction of effects. 9. The sky-haze is destitute of the fibrous twists and angular branches of cirrus, and, since the sunlight leaves it in regular progression, it must be stratified at the same uniform level. 10. It has always been visible on every clear day for more than two months, and has been quite independent of wind and weather.

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* This is from an aneroid barometer, which is believed to be nearly correct.

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## THE WINTER OF 1883–84.

*To the Editor of the Meteorological Magazine.*

SIR,—December, January and February constituting the three winter months, we are now in a position to review the winter season of 1883-84. The remarkable feature about an exceedingly mild and excessively dry winter seems to be the smallness of the rainfall, notwithstanding the prevalence of S.W. wind, which generally produces mild but wet seasons. I append a short summary of my own observations, placing side by side the record of the last four winters; from this it will be seen that with a higher temperature and *a larger percentage of S.W. wind*, there has been a *far smaller* fall in the winter of 1883-84 than in the corresponding season of the three preceding years. I think that those whose record carries them back considerably further than mine carries me, will find it is many years since we experienced a winter at the same time so uniformly mild and dry.

| | 1880-81. | 1881-82. | 1882-83. | 1883-84. |
|---|---|---|---|---|
| Temperature, Mean ..... | 34·9 | 38·8 | 39·0 | 39·8 |
| ,, Absolute Max. ... | 53·9 | 53·4 | 54·5 | 53·9 |
| ,, ,, Min. ... | 10·7 | 24·9 | 19·1 | 26·7 |
| Frosty nights ..... | 44 | 52 | 50 | 50 |
| Rainfall Total ..... | 6·60 | 6·16 | 7·96 | 3·75 |
| Number of Wet Days ..... | 53 | 41 | 66 | 42 |
| Wind, Percentage of S.W..... | 14 | 23 | 15 | 25 |

Thermometers are verified and placed in a Stevenson screen.

Yours faithfully,

C. W. HARVEY, F.R.Met.Soc.

*Throcking Rectory, Herts, March, 1884.*

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## THE FORTH BRIDGE.

DURING the gales of the 26th and 27th ult., unprecedented wind pressures were experienced at the Forth Bridge works. We learn from Mr. B. Baker, M.I.C.E., that the strongest gusts gave a momentary pressure of 35¼ lbs. per square foot on the large board 300 square feet area, put up under the instructions of Mr. Baker, and no less than 65 lbs. per square foot on the small board containing 1·5 square feet.—*The Engineer, Feb. 1, 1884.*

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## NATURAL BAROMETER.

THE natives of the Chiloe Islands make use of a curious natural barometer, to which, from its having been first noticed by the captain of an Italian corvette, the name, "Barometro Araucano" has been given. This novel weather guide was described at a recent meeting of the Linnean Society of New South Wales, as the shell of a crab, one of the *Anomura*, probably of the genus *Lithodes*. It is peculiarly sensitive to atmospheric changes, is nearly white in dry weather but exhibits small red spots on the approach of moisture, and becomes completely red in the rainy season.—*English Mechanic.*

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1883.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 84·7 | 2 | 42·1 | 16 | 70 5 | 52·1 | 50·7 | 81 | 112·9 | 48·1 | 2·92 | 14 | 6·4 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 76·5 | 5 | 58·0 | 25 | 73·4 | 64·1 | 58·8 | 70 | ... | ... | ·72 | 12 | 5·3 |
| Calcutta | 92·5 | 11 | 74·9 | 18 | 88·0 | 78·5 | 78·3 | 87 | 158·4 | 73·6 | 16·16 | 27 | 8·8 |
| Madras | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bombay | 86·6 | 6 | 73·4 | 10 | 84·2 | 76·8 | 76·7 | 87 | 140·2 | 72·0 | 39·88 | 29 | 9·2 |
| Ceylon, Colombo | 87·0 | 2 | 72·8 | 16 | 84·8 | 77·6 | 71·3 | 75 | 148·0 | 63·5 | 3·16 | 12 | 7·8 |
| *Melbourne* | 62·0 | 1 | 31·7 | 23 | 55·0 | 41·4 | 41·7 | 80 | 109·5 | 26·2 | 2·55 | 14 | 6·1 |
| *Adelaide* | 66·5 | 6 | 34·2 | 20 | 58·2 | 44·5 | 42·9 | 73 | 130·2 | 25·1 | 4·20 | 17 | 5·2 |
| *Wellington* | 59·4 | 14 | 32·0 | 6 | 51·6 | 42·0 | ... | ... | 110·0 | 30·0 | 6·27 | 24 | ... |
| *Auckland* | 61·0 | 1, 15 | 36·0 | 23 | 57·0 | 47·4 | 44·2 | 74 | 126·0 | 30·5 | 4·79 | 25 | 5·8 |
| *Falkland Isles* | 48·0 | 9 | 21·1 | 20 | 41·2 | 33·2 | 35·0 | 90 | 93·0 | 22·4 | 2·63 | 19 | 6·4 |
| Jamaica | 93·3 | 28 | 70·6 | 17 | 88·6 | 73·8 | 71·5 | 72 | ... | 62·6 | 1·25 | 5 | 6·0 |
| Barbados | 83·0 | 10 | 70·0 | 3,27 | 82·0 | 72·0 | 74·1 | 85 | 147·0 | 69·0 | 5·46 | 15 | 6·6 |
| Toronto | 83·4 | 4 | 46·1 | 1 | 74·7 | 55·9 | 58·0 | 73 | 146·4 | 39·8 | 5·57 | 14 | 5·5 |
| New Brunswick, Fredericton | 87·7 | 6 | 38·0 | 1 | 75·9 | 52·9 | 56·6 | 74 | ... | ... | 4·37 | 13 | 5·8 |
| Manitoba, Winnipeg | 84·5 | 25 | 43·0 | 3, 7 | 74·6 | 50·0 | 54·6 | 55 | ... | ... | 1·63 | 8 | 6·7 |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

### REMARKS, JULY, 1883.

*Mauritius.*—Rainfall 1·88 in. below, and mean temp 0°·3 above the average; mean pressure 30·216 in.; mean hourly velocity of wind 11·9 miles, extremes 27·6 miles on 31st, and 1·7 miles on 25th, prevailing direction E.S.E. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred on the 10th, 11th and 12th. G. H. SYMONDS.

*Melbourne.*—Mean temp. of air and of dewpoint slightly above the average, and rainfall ·80 in. above it. Prevailing direction of wind N.; strong breezes occurred on 8 days, dense fog on 3rd, 4th and 19th, H showers on 9th, heavy dew on 8 days, hoar frost on 6 days, ice on 4 days; lunar rainbow on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure 30·212 in., being slightly above the average. Mean temp. 0°·3 below the average; the night of the 19th–20th, was the coldest with one exception experienced for the last 20 years, the min. temp. being 34°·2, while the thermometer on wool registered 22°·9. The rainfall at Adelaide was nearly 1·75 in. above the average of the previous 26 years; the fall was heavy at all places on the Adelaide plains, and especially in the Mount Lofty ranges, where over 8 inches fell. A severe shock of earthquake was experienced at Adelaide on the night of July 7th, and a severe shock was felt at Launceston (Tasmania) on 13th. C. TODD.

*Wellington.*—Showery cold weather almost throughout the month; prevailing winds S.E. and N.E.; very strong on nights of 3rd, 7th and 10th, with R; T on 19th, H on 21st; earthquakes on 4th, 5th and 9th. Mean pressure slightly below, and mean temp. 1°·0 below the average. R. B. GORE.

*Auckland.*—Mean pressure below the average, mean temp. slightly above the average, rainfall also slightly above it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. 76°·0, the same as the average of 25 years, prevailing direction of wind N.E., average velocity 13·9 miles per hour; rainfall 13 per cent. below the average. Five days were overcast; TS on 1st, T and L on 17th.

R. BOWIE WALCOTT.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1883.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 82·7 | 21 | 46·9 | 20 | 73·4 | 54·2 | 52·8 | 71 | 113·2 | 49·6 | ·93 | 10 | 5·7 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 77·5 | 3 | 58·6 | 18† | 74·1 | 64·2 | 59·5 | 72 | ... | ... | 1·33 | 16 | 6·0 |
| Calcutta | 89·7 | 9 | 74·2 | 14 | 87·3 | 78·8 | 78·1 | 87 | 156·5 | 70·8 | 8·15 | 26 | 8·8 |
| Madras | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bombay | 88·1 | 17 | 72·0 | 30 | 84·1 | 77·0 | 75·3 | 84 | 143·2 | 70·5 | 12·57 | 26 | 8·1 |
| Ceylon, Colombo | 86·9 | 2,4 | 72·4 | 30 | 82·0 | 76·3 | 73·5 | 84 | 145·5 | 68·0 | 17·86 | 22 | 7·8 |
| *Melbourne* | 67·2 | 26 | 32·9 | 22 | 59·3 | 42·9 | 41·0 | 71 | 125·0 | 27·9 | ·87 | 8 | 5·5 |
| *Adelaide* | 67·2 | 3 | 37·6 | 22 | 60·4 | 44·4 | 43·3 | 72 | 133·0 | 31·6 | 3·05 | 16 | 4·8 |
| *Wellington* | 65·0 | 21 | 33·0 | 6 | 55·1 | 43·2 | ... | ... | 116·0 | 30·0 | 3·61 | 13 | ... |
| *Auckland* | 63·0 | 22 | 36·5 | 7,24 | 57·0 | 45·1 | 43·8 | 77 | 126·0 | 31·0 | 4·41 | 17 | 5·4 |
| *Falkland Isles* | 50·3 | 28 | 22·3 | 8 | 42·5 | 33·2 | 35·5 | 90 | 104·0 | 18·8 | 1·17 | 17 | 6·7 |
| Jamaica, Kingston | 90·8 | 15 | 70·7 | 11 | 88·5 | 73·6 | 74·1 | 81 | ... | 63·2 | 6·62 | 12 | 4·1 |
| Barbados | 86·0 | 24* | 71·0 | 5 | 83·0 | 73·0 | 74·8 | 83 | 154·0 | 71·0 | 5·12 | 12 | 6·0 |
| Toronto | 82·7 | 22 | 46·3 | 7 | 72·9 | 54·1 | 55·2 | 70 | 141·8 | 39·0 | 1·83 | 8 | 4·8 |
| New Brunswick, Fredericton | 89·7 | 23 | 40·3 | 29 | 76·6 | 51·5 | 54·7 | 75 | 76·6 | 51·5 | 1·06 | 12 | 4·7 |
| Manitoba, Winnipeg | 84·8 | 8 | 40·0 | 23‡ | 73·7 | 48·7 | 54·9 | 55 | ... | ... | 2·97 | 14 | 7·0 |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 25. † And 31. ‡ And 26.

REMARKS, AUGUST, 1883.

*Mauritius.*—Rainfall ·59 in. below, and temp. 0°·3 above the average; mean pressure 30·156 in.; prevailing direction of wind E.S.E., mean hourly velocity 11·7 miles; strong trade wind blew from 25th to the end of the month; an unusual disturbance of the tides occurred on 27th. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred daily from 9th to 16th inclusive; T was heard on 7th and 8th, and L was seen on 19th. Earthquake on 27th. G. H. SYMONDS.

*Melbourne.*—Mean pressure, mean temp. and humidity all about the average; mean temp. of dew point 1°·2, amount of cloud ·7, and rainfall 1·07 in. below their respective averages; prevailing direction of wind N., strong breezes on 7 days, heavy dew on 7 days, hoar frost on 5 days, severe TS on 4th. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure 30·116, slightly below the average of the previous 26 years; min. 29·416 in. on 11th, the lowest reading in August with one exception; mean temp. (52°·4) was 1°·6 below the average; amount of cloud ·7 below the average; rainfall nearly 1 inch above it. The rainfall was considerably in excess of the average over the colony generally. C. TODD.

*Wellington.*—Up to 4th the weather was showery and dull, with S.E. wind; from 5th to 12th bright, with N.W. wind; a severe N.W. gale occurred on 13th, followed by R on 14th; 15th fine, with falling bar, and at night heavy R; from 17th to 21st fine, from 22nd to 26th cold and showery, with H on 22nd-24th; the weather was then fine until the night of 30th, when the wind changed to S.E. with R. Prevailing winds N.W.; mean temp., 1°·1 above the average. R. B. GORE.

AUCKLAND.—Mean pressure a little above the average, mean temp. slightly below the average; rainfall above it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. 77°·2, very slightly above the average; mean hourly velocity of wind 9·0 miles; rainfall 52 per cent. below the average; five days were overcast. TS to N.W. on 25th. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·92 | XI. | Carno, Tybrith ... ..... | 5·45 |
| ,, | Margate, Birchington... | 1·14 | ,, | Corwen, Rhug ..... | 4·65 |
| ,, | Littlehampton .. ..... | 1·72 | ,, | Port Madoc ..... | 5·58 |
| ,, | Hailsham ..... | 1·81 | ,, | I. of Man, Douglas ..... | 4·79 |
| ,, | I. of W., St. Lawrence. | 2·29 | XII. | Stoneykirk, Ardwell Ho. | 4·30 |
| ,, | Alton, Ashdell..... | 3·01 | ,, | Melrose, Abbey Gate.. | 3·87 |
| III. | Winslow, Addington ... | 1·23 | XIII. | N. Esk Res. [Penicuick] | 3·55 |
| ,, | Oxford, Magdalen Col... | 1·32 | XIV. | Ayr, Cassillis House ... | 3·93 |
| ,, | Northampton ..... | ·60 | ,, | Glasgow, Queen's Park. | 5·04 |
| ,, | Cambridge, Beech Ho... | ·66 | XV. | Islay, Gruinart School.. | 4·02 |
| IV. | Southend ..... | ·99 | XVI. | St. Andrews, Newton Bk | 1·73 |
| ,, | Harlow, Sheering ... .. | 1·16 | ,, | Balquhidder, Stronvar.. | 12·20 |
| ,, | Diss ..... | ·83 | ,, | Dunkeld, Inver Braan.. | 6·47 |
| ,, | Swaffham ..... | ·91 | ,, | Dalnaspidal H.R.S. ... | 5·36 |
| ,, | Hindringham ..... | ·89 | XVII. | Keith H.R.S. ..... ..... | 1·11 |
| V. | Salisbury, Alderbury... | 2·35 | ,, | Forres H.R.S. ..... ... | ·93 |
| ,, | Warminster ..... | 2·61 | XVIII. | Strome Ferry H.R.S.... | 6·01 |
| ,, | Calne, Compton Bassett | 1·58 | ,, | Lochbroom ..... | 4·58 |
| ,, | Ashburton, Holne Vic.. | 10·29 | ,, | Tain, Springfield..... | 1·04 |
| ,, | Holsworthy, Clawton... | 3·95 | ,, | Loch Shiel, Glenaladale | 14·11 |
| ,, | Lynmouth, Glenthorne. | 4·54 | ,, | Invergarry ..... | 7·51 |
| ,, | Probus, Lamellyn ..... | 6·29 | XIX. | Lairg H.R.S. ..... | 1·05 |
| ,, | Wincanton, Stowell Rec. | 2·35 | ,, | Forsinard H.R.S. ..... | 1·45 |
| ,, | Taunton, Fullands ..... | 2·68 | ,, | Watten H.R.S. ..... | ·85 |
| VI. | Bristol, Clifton ..... .. | 1·85 | XX. | Dunmanway, Coolkelure | 11·38 |
| ,, | Ross ..... | 2·66 | ,, | Fermoy, Gas Works ... | 7·42 |
| ,, | Wem, Sansaw Hall..... | 2·02 | ,, | Tralee, Castlemorris ... | 5·30 |
| ,, | Cheadle, The Heath Ho. | 2·06 | ,, | Tipperary, Henry Street | 5·31 |
| ,, | Worcester, Diglis Lock | 2·02 | ,, | Newcastle West ..... | 5·06 |
| ,, | Coventry, Coundon..... | 1·87 | ,, | Miltown Malbay..... | 4·09 |
| VII. | Melton, Coston ..... | ·85 | ,, | Corofin ..... | 4·39 |
| ,, | Ketton Hall [Stamford] | ·85 | XXI. | Carlow, Browne's Hill.. | 4·42 |
| ,, | Horncastle, Bucknall ... | 1·46 | ,, | Navan, Balrath ..... | 2·75 |
| ,, | Mansfield, St. John's St. | 2·78 | ,, | Mullingar, Belvedere... | 3·26 |
| VIII. | Macclesfield, The Park. | 1·53 | ,, | Athlone, Twyford ..... | 4·49 |
| ,, | Walton-on-the-Hill..... | 2·71 | XXII. | Galway, Queen's Col.... | 4·16 |
| ,, | Lancaster, South Road. | 2·24 | ,, | Clifden, Kylemore ..... | ... |
| ,, | Broughton-in-Furness .. | 5·09 | ,, | Crossmolina, Enniscoe.. | 4·72 |
| IX. | Wakefield, Stanley Vic. | 2·11 | ,, | Carrick-on-Shannon ... | 3·75 |
| ,, | Ripon, Mickley ..... | 2·09 | XXIII. | Dowra ..... | 2·96 |
| ,, | Scarborough..... | 1·75 | ,, | Rockcorry..... | 2·99 |
| ,, | East Layton [Darlington] | 1·35 | ,, | Warrenpoint ..... | 4·59 |
| ,, | Middleton, Mickleton .. | 2·38 | ,, | Newtownards ..... | 3·01 |
| X. | Haltwhistle, Unthank.. | 2·15 | ,, | Belfast, New Barnsley . | 3·38 |
| ,, | Shap, Copy Hill ..... | 7·45 | ,, | Cushendun ..... | 3·76 |
| XI, | Llanfrechfa Grange ..... | 4·64 | ,, | Bushmills ..... ..... | 3·16 |
| ,, | Llandovery ..... | 5·26 | ,, | Stewartstown ..... | 3·43 |
| ,, | Solva ..... | 3·72 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 8·52 | ,, | Buncrana ..... | 3·55 |
| ,, | Rhayader, Nantgwillt.. | 7·26 | ,, | Carndonagh ..... | 4·22 |

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# FEBRUARY, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade | No. of Nights below 32°. On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·40 | — ·24 | ·30 | 1 | 14 | 56·3 | 13 | 28·2 | 3 | 5 | 14 |
| II. | | Maidstone (Hunton Court)... | 1·57 | — ·05 | ·30 | 10 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 1·76 | + ·01 | ·27 | 1 | 13 | 55·1 | 13 | 27·4 | 3 | 6 | 15 |
| III. | | Hitchin ..... | ·93 | — ·67 | ·21 | 21 | 13 | 53·0 | 13 | 25·0 | 28 | 15 | ... |
| ,, | | Banbury ..... | ·96 | — ·88 | ·17 | 1, 9 | 13 | 53·0 | 13 | 25·5 | 29 | 11 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·55 | — 1·22 | ·11 | 21 | 14 | 53·0 | 14*b* | 25·0 | 29 | 8 | ... |
| ,, | | Norwich (Cossey) ..... | ·50 | — 1·25 | ·12 | 21 | 12 | 54·0 | 20 | 28·5 | 27*f* | 6 | 14 |
| V. | | Weymouth(LangtonHerring) | 3·08 | ... | ·34 | 27 | 20 | 52·0 | 20*c* | 26·0 | 3 | 2 | ... |
| ,, | | Barnstaple ..... | 4·45 | + 1·26 | ·77 | 1 | 22 | 54·0 | 1*d* | 29·0 | 3 | ... | ... |
| ,, | | Bodmin ..... | 7·69 | + 2·82 | 1·80 | 17 | 23 | 53·0 | 9 | 29·0 | 3 | 1 | 5 |
| VI. | | Cirencester .. ..... | 1·65 | — ·99 | ·35 | 9 | 16 | .. | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·29 | + ·79 | ·54 | 1 | 21 | 50·0 | 14 | 24·5 | 3 | 7 | 11 |
| ,, | | Tenbury (Orleton) ..... | 2·29 | — ·18 | ·34 | 17 | 17 | 54·0 | 14 | 26·7 | 29 | 6 | 13 |
| VII. | | Leicester ..... | ·96 | ... | ·33 | 1 | 13 | 55·2 | 13 | 28·0 | 29 | 4 | 10 |
| ,, | | Boston ..... | ·72 | — 1·06 | ·41 | 1 | ... | 55·0 | 12*e* | 29·0 | 27 | 4 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·57 | — ·23 | ·93 | 1 | 19 | 54·0 | 20 | 29·0 | 29 | 4 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·18 | ... | ·42 | 1 | 17 | 54·0 | 13 | 24·0 | 29 | 3 | ... |
| VIII. | | Manchester (Ardwick)..... | 2·00 | — ·19 | ·42 | 23 | 16 | 52·0 | 13 | 25·0 | 26 | 6 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·77 | + ·62 | 1·28 | 3 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 4·89 | + ·25 | ·85 | 9 | 21 | 50·0 | 22 | 24·0 | 22 | ... | ... |
| X. | | North Shields ..... | ·92 | — ·92 | ·15 | 1 | 17 | 53·8 | 4, 5 | 25·8 | 29 | 5 | 7 |
| ,, | | Borrowdale (Seathwaite)..... | 14·96 | + 3·51 | 2·12 | 9 | 21 | 49·8 | 13 | 26·7 | 3 | 2 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 4·63 | + ·97 | 1·34 | 17 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 6·84 | + 2·39 | 1·05 | 12 | 23 | 51·5 | 5 | 27·0 | 2 | 3 | 10 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 4·25 | ... | ·63 | 1 | 20 | ... | ... | ... | .. | ... | ... |
| ,, | | Llandudno..... | 2·98 | + ·69 | ·47 | 1 | 19 | 57·0 | 9 | 32·2 | 29 | 0 | ... |
| XII. | | Cargen [Dumfries] ..... | 6·96 | + 3·15 | 2·12 | 12 | 19 | 50·2 | 4 | 27·0 | 3 | 7 | ... |
| ,, | | Hawick ..... .. ..... | 4·18 | + 1·89 | 1·30 | 1 | 16 | ... | ... | .. | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 7·17 | + 4·00 | 1·54 | 12 | 22 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·77 | + 1·38 | 1·17 | 2 | 20 | 52·0 | 4 | 25·0 | 25 | 14 | ... |
| ,, | | Oban (Craigvarren) ..... | 4·27 | ... | ·59 | 20 | 16 | 51·0 | 9, 13 | 28·5 | 2 | 7 | ... |
| ,, | | Mull (Quinish)..... | 7·06 | ... | ·75 | 9 | 19 | ... | ... | ... | .. | ... | ... |
| XVI. | SCOTLAND. | Loch Leven Sluices ..... | 1·80 | — 1·16 | ·30 | 20 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... ..... | 1·75 | — ·41 | ·30 | 1, 9 | 14 | 50·0 | 4 | 30·0 | 29 | 6 | ... |
| XVII. | | Braemar ..... .. | 7·74 | + 5·07 | 2·10 | 12 | 17 | 47·0 | 5 | 16·2 | 29 | 19 | 25 |
| ,, | | Aberdeen ..... ..... | 1·90 | ... | ·46 | 13 | 20 | 53·0 | 4 | 27·0 | 7 | 6 | ... |
| XVIII | | Skye (Sligachan) ..... | 13·66 | ... | 2·00 | 10 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... ..... | 1·53 | + ·48 | ... | ... | ... | 52·0 | 9 | 25·0 | 29 | 7 | 24 |
| XIX. | | Dunrobin ..... ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Orkney (Sandwick)..... .. | 1·34 | — 1·21 | ·25 | 4 | 19 | 48·9 | 4 | 30·8 | 2 | 3 | 8 |
| XX. | | Cork (Blackrock) ..... | 9·44 | + 4·85 | 1·32 | 20 | 21 | 54·0 | 18 | 28·0 | 2 | 5 | .. |
| ,, | | Dromore Castle ..... | 8·30 | ... | 1·36 | 20 | 25 | 55·0 | 27 | 30·0 | 2 | 4 | ... |
| ,, | | Waterford (Brook Lodge) ... | 7·41 | ... | ·91 | 13 | 23 | 52·0 | 9 | 27·0 | 3 | 1 | 7 |
| ,, | | Killaloe ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XXI. | IRELAND. | Portarlington ..... ..... | 3·01 | + ·80 | ·50 | 9 | 24 | 53·5 | 9 | 30·5 | 2 | 3 | ... |
| ,, | | Dublin (FitzWilliam Square) | 3·52 | + 1·36 | ·70 | 13*a* | 20 | 54·6 | 9 | 31·8 | 2 | 2 | 3 |
| XXII. | | Ballinasloe ..... ..... | 3·66 | + 1·15 | ·76 | 20 | 24 | 50·0 | 19 | 30·0 | 2*g* | 9 | ... |
| XXIII | | Waringstown ..... ..... | 3·46 | + 1·21 | ·51 | 20*e* | 18 | 56·0 | 10 | 21·0 | 3 | 8 | 14 |
| ,, | | Londonderry (Creggan Res.). | 3·47 | ... | ·71 | 20 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·75 | + 1·47 | ·60 | 20 | 22 | 56·0 | 8 | 29·0 | 25 | 3 | ... |

+ Shows that the fall was above the average ; — that it was below it.

*b* And 15. *c* And 22. *d* And 10, 13, 15. *e* And 13. *f* And 19. *g* And 3, 11, 22, 26.

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# METEOROLOGICAL NOTES ON FEBRUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGIS.—On the whole the weather was mild and stormy, the R being sufficient to make the clay lands wet and unworkable, on lighter soils spring work is in a forward state. Red japonica in flower on 10th; elm in flower on 21st.

BANBURY.—A dry month with much wind; mean temp. 41°·4; vegetation very forward, and weather spring-like towards the end of the month; very welcome frosts on last three days; high wind on 10 days; gale on 20th; S on 3rd and 10th; L on 21st; fog on 7th, 8th and 9th.

CULFORD.—A fine open month, apricots in full bloom, and every kind of vegetation very forward; mean temp. 41°·2.

COSSEY.—A very dry month; the only Februarys on record with a smaller rainfall being 1857, 0·41 in., 1862, 0·40 in., and 1863, 0·45 in.

LANGTON HERRING.—Mean temp. 1°·5 above the average of 12 years; the only cold days were the 3rd and 29th; the contrast between the temp. at 9 a.m. on the 3rd and on the 4th is striking, the readings being 29°·0 and 45°·0 respectively. On 10th violent hailstorms occurred, accompanied by T and L, and a less violent hailstorm on 11th.

BODMIN.—Another singularly mild month, the temp. only once falling below 32°; mean temp. 43°.

CIRENCESTER.—A mild month with moderate rainfall.

WOOLSTASTON.—A wet month; S fell on 1st, 10th, 16th and 29th; a gale of great violence raged during the night of 20th-21st, accompanied by H; mean temp. 44°·6.

ORLETON.—Much R fell on 1st, and S on 2nd till 8 a.m., when the hills were covered; no R fell afterwards till the 9th, but the sky was generally obscured by clouds, after that date R fell every day till the 24th, making the heavy clay lands very wet; the remainder of the month was dry and colder, with occasional sunshine. The mean temp. was about 1°·5 below the average of 23 years, and the fluctuations were trifling.

LEICESTER.—The month was very dry and mild for the season.

KILLINGHOLME.—The month was unusually mild throughout; both wild and garden flowers blooming remarkably early; heavy R and N.E. gale on night of 1st, but very little R afterwards.

HESLEY HALL.—The weather was mild during the first half of the month, but cold during the latter half, especially on the last day; a little S on 28th.

ARDWICK.—February was on the whole a gloomy month, but not cold; R fell frequently, but not heavily. The temp. was rather high, and there was very little frost, and only one slight fall of S.

SEATHWAITE.—A violent storm of R occurred on the afternoon of the 20th, followed by a S.W. gale, which did considerable damage to plant and property.

## WALES.

HAVERFORDWEST.—The month generally was very stormy and milder than usual. A fierce gale from N. raged all night on 1st, by which roofs were much damaged, and trees blown down; damp, gloomy weather prevailed from 2nd to 8th, when another very serious depression passed over with H, L and sleet; at 8 a.m. terrible forked L, followed by very loud T, occurred over a great part of the county, several houses were struck, and much damage was done, the L struck the Treffgarn Rocks, splintering large masses and hundreds of smaller pieces, and hurling them to great distances, the L ploughing up the ground

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round about; the most violent gale of the winter occurred on the night of the 26th, when many large trees were blown down, plantations destroyed, and houses unroofed; the month continued unsettled, but colder, to the end; S fell on 7 days.

## SCOTLAND.

CARGEN.—A very dull, stormy month; rainfall greatly above the average, and sunshine less than half the average; a very severe gale was experienced between 2 a.m. and 4 a.m. of 22nd, causing much damage to trees and plantations in the district; mean temp. 40°·1, about the average; L on 9th; T on 21st.

HAWICK.—The month on the whole was mild and open. The 1st was very wet, 1 inch of R falling in 7 hours, which made every rivulet overflow; 4 in. of S fell on 29th.

CRAIGVARREN.—On the whole the month was fine and dry and unusually warm; the last week was very dry, cold and fair with S.E. wind, ending with a fall of S on 29th. Gale with T on 9th; very severe gale on 20th, one of the most severe since the Tay Bridge gale; several gables of new masonry were blown over.

ABERDEEN.—High S. to S.E. winds were frequent, and the weather was dry and open till 27th, when S and H set in; total rainfall considerably below the average; aurora on 29th; L on 22nd.

CULLODEN.—The month generally was fine, without S, and many days were warm and genial.

SANDWICK.—February was warmer and drier and more windy than the average; temp. 1°·2 above the average; wind 4126 miles above it; before the 12th S.W. winds prevailed, and after that S.E. winds almost every day; auroræ seen on 23rd and 29th.

BLACKROCK.—Very stormy weather prevailed up to the 23rd, causing much damage to life and property by land and sea; little sunshine and frequent heavy falls of R.

## IRELAND.

DROMORE CASTLE.—The characteristics of the month were high temp. and continual R with occasional storms; during a TS about the middle of the month, a house in a mountain glen was struck by L and part of the roof was taken off; three distinct streams of electric fluid could be traced, the furniture was damaged, and three cows and one pig in an out-building were killed, but several persons who were in the house were uninjured.

WATERFORD, BROOK LODGE.—The wettest February during the last 10 years, rainfall nearly 3 inches above the average for that period; H on 4 days; T and L on 20th and 21st; L on 19th; some of the hailstones that fell on 21st in Waterford were as large as marbles; northerly gale on 1st.

DUBLIN, FITZWILLIAM SQUARE.—The frostless character of the winter was maintained throughout February, but there was a decrease in the temp. owing to the increasing prevalence of S.E. winds; the amount of cloud was unusually large (7·7), and the weather was often cheerless and wet. A very violent S. gale occurred on the night of 20th; mean temp. 43°·0, about the average; S or sleet fell on 2nd, 10th and 11th; H on 10th; L was seen on 21st, and solar halos on 20th and 25th.

BALLINASLOE.—A very wet and blustering month; the country much flooded.

OMAGH, EDENFEL.—The weather of the month was as unsettled and wet as that of January, but with a considerably lower temp.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXIX.] APRIL, 1884. [PRICE FOURPENCE, *or 5s. per ann. post free.*

## JANUARY, 1884, IN THE UNITED STATES.

WHILE we in England during January were revelling in unnatural warmth, and were surrounded by a profusion of flowers almost spring-like, North America, especially the eastern part of the continent, was suffering so great an extreme of cold that in many cases the population suffered considerably, and live stock was frozen to death.

We have considered these conditions sufficiently important and interesting to call for a brief précis of the observations and remarks published in the *Monthly Weather Review* issued by the Signal Service of the United States. We have adhered to the arrangement adopted in the original, merely extracting the most striking facts, and adding a few notes and comments.

The first table gives the mean temperature for January, 1884, and the difference from the average of a series of years for the different districts; we quote all cases where the deficiency exceeds 5° and for some of them have been able to add the maximum departures from the normal temperature during the eleven Januarys 1873–83 :—

| DISTRICTS. | Mean, Jan. 1884. | Diff. from the average of several years. | Greatest departures, 1873–83. | |
|---|---|---|---|---|
| | | | Amount. | Year. |
| | ° | ° | ° | |
| Ohio Valley | 24·8 | —8·2. | ... | ... |
| Tennessee | 31·8 | —8·2 | ... | ... |
| Eastern Gulf States | 41·2 | —8·2 | ... | ... |
| Western Gulf States | 40·9 | —7·0 | —7·6 | 1881 |
| Upper Lake Region | 13·0 | —6·6 | —9·7 | 1875 |
| Lower Lake Region | 18·7 | —6·4 | —9·5 | 1875 |
| Upper Mississipi Valley | 17·9 | —6·0 | —11·6 | 1875 |
| Southern Slope | 39·0 | —6·0 | —8·9 | 1881 |
| Rio Grande Valley | 52·6 | —5·3 | ... | ... |



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The general conditions of mean temperature are summed up as follows, and numerous remarks by the observers are added :—

"The month of January, 1884, was slightly warmer than the average in California, in the northern and middle slopes, and in the middle and southern plateau districts. A comparison of the mean temperatures for January in those districts with the normal, shows departures of from 0°·5 to 0°·9, except in Southern California, where it amounted to 1°·6. The mean temp. for the northern plateau does not differ from the normal for that district. In the North Pacific coast region, and in all districts east of the Rocky mountains, excepting the Northern and Middle Slopes, the mean temperature of the month has been below the average. A marked deficiency of 8°·2 occurred in the Ohio valley, Tennessee, and the Eastern Gulf States. In the Lake region, Upper Mississippi valley, West Gulf States, and Southern Slope, the deficiencies ranged from 6° to 7°. In the other districts east of the Rocky mountains, where deficiencies occurred, they varied from 2°·3 in New England to 5°·3 in the Rio Grande valley."

ALABAMA.

"*Green Springs, Hale County.*—Mean temp., 37°·6, is 9° below the mean of January, 1883, and is the lowest monthly mean that has occurred during the last ten years."

ILLINOIS.

"*Anna, Union County.*—Mean temp., 25°·6, is 7°·2 below the January average of nine years. The temperatures for two of the coldest months of which there is a record, are—

| | January, 1864. | | January, 1884. |
|---|---|---|---|
| Highest temperature ..... | 67° | ..... | 65° |
| Lowest ,, ..... ..... | —22° | ..... | —21° |
| Monthly mean temperature..... | 32°·2 | ..... | 25°·6 |
| Highest daily mean temperature | 58°·5 | ..... | 60°·0 |
| Lowest ,, ,, ,, | —11°·7 | ..... | —15°·0 |

"*Riley, McHenry County.*—Mean temp,, 9°·8, is 8° below the January average of the last 21 years, and is, with the exception of that for January, 1875, the lowest for the period named."

INDIANA.

"*Logansport, Cass County.*—Mean temp., 18°·6 is 11°·3 below the January average of the last 25 years."

MASSACHUSETTS.

"Mr. J. B. Hall, of *Worcester*, reports the mean temp. of January for a period of 45 years to be 29°·6 (?), and the mean for January, 1884, to be 20°·4, or 9°·2 (?) below the normal."

MISSOURI.

"*Saint Louis.*—Prof. Nipher, director of the 'Missouri Weather Service,' reports as follows : January has been unusually cold. The average temperature at the central station was 22°·3, which is 9°·1 below the normal January temperature for St. Louis, as shown by Dr. Engelmann's series for 49 years. The average January tempera-

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ture was, however, lower than the mean for January, 1884, in the following years, viz., 20°·2 in 1856, 19°·3 in 1857, and 21°·3 in 1875."

NEW YORK.

"*Palermo, Oswego County.*—Mean temp., 14°·1, is 7°·5 below the January average of the last 31 years. The lowest January mean of that period, 12°·8, occurred in 1881."

OHIO.

"*Wauseon, Fulton County.*—Mean temp., 14°·5, is 9°·5 below the January average of the last 14 years. The lowest January mean of that period, 12°·2, occurred in 1875."

The absolute minimum temperatures for the month are next dealt with, and out of a total number of 162 readings, no fewer than 101 (63 per cent.) are below zero, 32 being below —25° and 4 below —40°.

A table is given of 64 Signal Service stations with comparisons with previous years, and all stations where the 1884 reading was the lowest, appear below :—

| State or Territory. | Minimum for January, 1884. | | Minimum in Previous years. | |
|---|---|---|---|---|
| | Station. | Temp. | Temp. | Year. |
| | | ° | ° | |
| Alabama | Montgomery | 8 | 14 | '73, '79 |
| Arkansas | Fort Smith | —5 | 2 | 1883 |
| Delaware | Delaware Breakwater | 9 | 10 | 1882 |
| Georgia | Atlanta | —1·3 | 9 | 1879 |
| ,, | Augusta | 14 | 15 | 1873 |
| Illinois | Chicago | —18·5 | —18 | 1879 |
| Indiana | Indianapolis | —25 | —22 | 1879 |
| Kentucky | Louisville | —19 | —10 | '74, '79 |
| Minnesota | Moorhead | —43 | —42 | 1882 |
| Missouri | St. Louis | —21·5 | —16 | 1875 |
| Nebraska | Omaha | —38 | —22 | 1879 |
| North Carolina | Charlotte | 5 | 11 | '79, '81 |
| Ohio | Columbus | —20 | —20 | 1879 |
| South Carolina | Charleston | 13 | 19 | 1873 |
| Tennessee | Knoxville | —16 | —14 | 1877 |
| ,, | Nashville | —10 | —8 | 1877 |

Many of these temperatures would appear much more striking if we compared them with corresponding readings for European stations, roughly, in the same latitude; thus we have—

| | | Min. temp. | | | Min. temp. |
|---|---|---|---|---|---|
| Knoxville | Lat. 36 | —16° | Malta | Lat. 36 | 42°·7 |
| Nashville | ,, 36 | —10° | | | |
| Indianapolis | ,, 40 | —25° | Madrid | ,, 40 | 15°·8 |
| Columbus | ,, 40 | —20° | | | |

While of the four stations with minimum temperatures below —40° Montana, Poplar River, —48°; Dakota, Fort Yates, —45°·5; Fort

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Lincoln, —45°; and Minnesota, Moorhead, —43°, not one is nearly as far north as either Paris or London.

This, perhaps, is a rather needless comparison, for it simply shows that latitude alone is very little guide as to the climate of a station, but the following remarks clearly show by comparisons with previous years that the temperatures registered in January, 1884, were exceptionally severe.

*(To be continued.)*

## THE SUN GLOWS.

*The Sun Glows.* By HENRY A. HAZEN. (Excerpt "American Journal of Science." March, 1884. 8vo.)

THIS is a very business-like paper, as will readily be seen by the following extracts :—

It is the purpose of this article to give :

1st. A general idea of the earliest appearances of the phenomenon. 2nd. To describe what may be seen by an ordinary observer even to-day. 3rd. To present the vapor theory and answer objections. 4th. To show why the "volcanic ashes" and "cosmic dust" hypotheses are untenable.

Remarkable sunset phenomena are reported as occurring on various dates at the following places :—

| Date. | Place. | Lat. | Long. |
|---|---|---|---|
| 1883, Aug. 28. | Mauritius | 20°S. | 57°E. |
| 30. | Maranham, Brazil | 2 S. | 44 W. |
| Sept. 1. | New Ireland | 5 S. | 152 E. |
| 2. | Venezuela | 10 N | 65 W. |
| 5. | Hawaii | 20 N. | 156 W. |
| 8. | Ceylon | 7 N. | 80 E. |
| 15. | South Australia | 38 S. | 143 E. |
| 20. | Cape of Good Hope | 35 S. | 20 E. |
| Oct. 8. | Florida | 29 N. | 82 W. |
| 19. | Yuma, California | 33 N. | 114 W. |
| Nov. 9. | England | 52 N. | 0 |
| 20. | Turkey. | | |
| 27. | British Columbia, Ala., Cal., Conn., Dak., Fla., Ga., Ills., Ind., Iowa, Kans., Me., Md., Mass., Mich., Mo., Neb., N. H., N. Y., N. C., Pa., Va., Wis., Germany, Italy, Spain, France, Sweden, England. | | |

Allowing for cloudiness, on certain days, it will be seen that before September 8th a belt of the earth's surface 15° on either side of the equator was suddenly visited by the phenomenon. At first sight it might appear that there was a regular progression from the Indian Ocean westward, but on that supposition it would be hardly possible to explain why Venezuela should have seen the glow six days earlier than Ceylon, though somewhat farther north. The phenomenon might have been seen at Hawaii and even at Ceylon the last of August had it not been for cloudiness; and granting this, it is plain that appearances might have been well nigh instantaneous over the regions near the equator. The glow was marked at Yuma on October 19, 20 and 21, after which

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it ceased for a month. It was first seen in the eastern United States on October 30th, when the appearance was very brilliant; the same sight presented itself the next night, but after that it did not again appear as bright, though carefully looked for, until November 27th. On this night the spectacle in the south-west was grand, and acknowledged by all as the finest even to the present time. The fire engines at Poughkeepsie, N. Y., and at New Haven, Conn., were summoned to "quench the burning skies." On the succeeding night the scene was nearly the same. Since November 28th the phenomenon has continued more or less brilliant, and with a few complete absences it has appeared down to the present (Feb. 3rd, 1884.)

A very remarkable fact is to be noted in connection with the display of November 26th and 27th, and that is, the sudden brightening over an immense region extending over half of Europe, over nearly the whole of the United States and British Columbia, though it had not been specially noted for about a month previous.

The author believes the phenomena to be due to vapour or ice particles at a great elevation, but we do not see that he deals with the fact that there are no records of the unusual prevalence of halos, parhelia, &c., which we have been taught to consider as connected therewith.

We do not see that the author states how the vapour got to, or remained at, such an exceptional altitude as the duration of the glows after sunset indicated.

Lieut. Hazen's remarks upon the Krakatoa dust theory we reprint verbatim.

A most singular hypothesis has been advanced to account for the material in the sky, namely, that the volcanic action at Krakatoa on August 26th and 27th ejected, into the atmosphere, immense masses of ashes which have been distributed by air currents over the earth's surface. Vivid accounts of the terrific nature of this convulsion, whereby a mountain island 2000 feet in height was perceptibly lowered, have been published by eye-witnesses. The position of the volcano was in lat. 6° 12′ S., long. 105° 28′ E. By comparing this position with the dates and positions of the first appearance of the after-glows as already given, it would seem as though there had been a natural progression, but it has been shown that an instantaneous appearance will account for the phenomena as easily. The following are advanced as a few of the objections to this theory.

1st. There must have been sufficient material ejected to cover more than 135,000,000 square miles (the earth's surface 45° both sides of the equator). The attempt to add to this quantity by instancing isolated and slightly active volcanoes thousands of miles away can be regarded only as an endeavour to support a weak cause.

2nd. There must have been currents of nearly equal force acting in opposite directions at the same height in the atmosphere, an impossible condition. Meteorology has established that if anything there is a steady current in the upper regions from west to east.

3rd. The upper currents must have had sufficient velocity to carry the ashes a distance of 12,000 miles in 150 hours, or at a rate of 80 miles per hour toward the west. We know little of velocities of air-currents at great heights, but they are probably slight. The summer velocity on Mt. Washington, 6299 feet

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above sea, is less than 30 miles per hour; while on Pike's Peak, 14,134 feet in height, it is only 20 miles per hour. The conditions certainly are very diverse at the two stations, and it is possible that the Mt. Washington velocities are 15 per cent. too high, but, allowing for these, there seems to be a possibility of a gradual diminution in wind velocity at increasing heights above the earth's surface.

4th. That the ashes must have been mechanically distributed first along a belt near the equator, and afterward, without addition, except possibly of a meagre character, the currents must have been sufficiently uniform over the whole earth, to have borne them north and south to above latitude 45°. This is well nigh incredible. It seems probable that in a few radial lines from Krakatoa, ashes could have been carried 1,500 or 2,000 miles, and some sporadic cases even greater distances. Professor Loomis, in his Meteorology, gives an instance in which volcanic ashes were carried 1,200 miles in a single direction, nearly parallel to the equator, but it is more than likely that these were carried in comparatively narrow streams, and that almost the entire mass of matter ejected from a volcano returns to the earth within a few hundred miles. A good illustration of the nature of a stream of volcanic ashes is given by Mr. Whymper, in a recent number of "Nature." He gives a description of a cloud of ashes poured forth from the crater of a volcano, carried in a stream in one direction and afterward in another at right angles, but that there was no uniform distribution is plainly shown by the narrative.

5th. That the intermittent nature of the phenomenon precludes the idea of a dust envelope.

6th. That ashes are opaque, while the appearances indicate great transparency.

The author's final paragraph is one which few will dispute:—

While all explanations of the glows are more or less matters of conjecture, yet the field of conjecture is believed to be narrowing, and we may hope ultimately to reach a satisfactory conclusion.

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## "THE WINTER OF 1883–84."

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to Mr. Harvey's letter under the above heading, I have ventured to send you my figures to compare with his.

| | | | |
|---|---|---|---|
| Mean temp. ..... .. | 41°·7 | Frosty nights ..... | 17 |
| Absolute max. ... . ... | 51 ·0 | Total rainfall ..... | 8·93 in. |
| ,, min. ..... | 21 ·0 | Wet days .... ..... ... | 64 |

The above figures show that here it has been a very mild and very wet winter. The difference in the number of frosty nights is remarkable, as well as in the number of wet days, between Mr. Harvey's record and mine. The rainfall has been above the average of the previous eleven winters, being 8·93 in. against 8·74 in.; whilst the number of wet days (64) is the greatest in any year except 1877. I may also say that the winter of 1880-81 was at once the coldest and the driest I ever recorded.—Yours respectfully, S. KING.

*Elswick Lodge, near Garstang, March 27th, 1884.*

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## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 19th inst., at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. W. Baily, M.A., W. L. Blore, A. L. Ford, H. Leupold, A. F. Lindemann, F.R.A.S., and Rev. E. B. Smith were elected Fellows of the Society.

The President read a paper entitled, "Brief Notes on the History of Thermometers." He stated that the subject had been handled in a comprehensive manner by Mons. Renou a few years ago, in the *Annuaire* of the French Meteorological Society, so that he should merely mention some of the leading points. The name of the actual inventor of the instrument is unknown. The earliest mention of it, as an instrument then 50 years old, was in a work by Dr. R. Fludd, published in 1638. Bacon also, who died in 1636, mentions it. The earliest thermometers were really sympiezometers, as the end of the tube was open and plunged into water, which rose or fell in the tube as the air in the bulb was expanded or contracted. Such instruments were of course affected by pressure as well as temperature, as Pascal soon discovered. However, simultaneously with such instruments, thermometers with closed tubes had been made at Florence, and some of these old instruments were shown at the loan collection of scientific apparatus at South Kensington in 1876. They are in the collection of the Florentine Academy, and in general principle of construction they are identical with modern thermometers. Passing on to the instrument as we now have it, Mr. Scott said that most of the improvements in construction in the earliest days of the instrument were due to Englishmen. Robert Hooke suggested the use of the freezing point; Halley the use of the boiling point, and the employment of mercury instead of spirit; and Newton was the first to mention blood heat. Fahrenheit was a German by birth, but was a protégé of James I., and died in England. Réaumur's thermometer in its final form owes its origin to De Luc; while the Centigrade thermometer, almost universally attributed to Celsius, was really invented by Linnæus. Celsius's instrument had its scale the reverse way, the boiling point being 0°, and the freezing point 100°. Mr. Scott then gave a brief account of some of the principal forms of self-registering and self-recording thermometers.

After the reading of this paper, the meeting was adjourned, in order to afford the Fellows and their friends an opportunity of inspecting the Exhibition of Thermometers and of Instruments recently invented. This Exhibition was a very interesting one, and embraced 136 exhibits. The thermometers were classified as follows:—(1) Standard, (2) Maximum, (3) Minimum, (4) Combined Maximum and Minimum, (5) Metallic, (6) Self-Recording, (7) Solar Radiation, (8), Sea, (9) Earth and Well, (10) Thermometers used for Special Purposes, (11) Thermometers with various forms of bulbs,

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scales, &c., and (12) Miscellaneous Thermometers. In addition to these, there were also exhibited various patterns of thermometer screens, as well as several new meteorological instruments, together with drawings, photographs, &c.

## SPECTROSCOPIC WEATHER FORECASTING.

*To the Editor of the Meteorological Magazine.*

SIR,—I send you a summary of daily forecasts by Grace's rain-band spectroscope for the last three months.

I keep the record under seven different heads, and even in the most settled weather I find variations, so that on scarcely two consecutive days do I ever get exactly the same reading, although the total value of the observation may be the same.

I usually observe at 9 a.m., but on several occasions in January I have had to take a second observation at about 11, owing to insufficiency of light at 9 a.m.

I have, I think, been rather inclined to favour the spectroscope in the summarised results, and have never entered the forecast as (F.) false unless it was utterly and entirely wide of the mark.

On two of the wettest days the spectroscope gave no warning at all, viz., January 26th and 31st; on two other days February 19th and March 4th, it gave a very valuable warning in contradiction to the barometer. On one day, February 15th, it threatened a good deal of rain, but it proved one of the finest days of the month.—I am, Sir, yours truly,

JOHN T. HARDING.

*Pentwyn, near Monmouth, April 2, 1884.*

| 1884 | No. of Observations. | True. | Approximately True. | False. |
|---|---|---|---|---|
| January ..... | 31 | 19 | 9 | 3 |
| February ..... | 29 | 16 | 5 | 8 |
| March ..... | 31 | 22 | 7 | 2 |

## RAINFALL AT UPPINGHAM.

BY the kindness of the Rev. G. H. Mullins, M.A., F.R.Met.Soc., we have the pleasure of issuing with this number a summary of the rainfall at Uppingham for the past ten years. It is remarkable as being one of the few stations at which July is the month of greatest rainfall, but its excess above October is evidently due to the storms of July 1875 and 1880. This prevalence of a maximum in July seems characteristic of the very central position of Rutland, for on referring to the investigation of seasonal rainfall in the *British Association Report*, 1873, it will be found that almost identical values are given by the observations made at Lyndon in Rutland between 1740 and 1789, and they are almost the only records which give a maximum in that month.

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# Summary of Rainfall at Uppingham for the Ten Years 1874-83, in inches.

## Height above Mean Sea Level, 484 feet. Long. 0°44′ W. Lat. 52°35′ N.

| | *1874 | *1875 | 1876 | 1877 | 1878 | 1879 | 1880 | 1881 | 1882 | 1883 | Mean. | Greatest fall in Month | Year. | Least fall in Month. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JANUARY | 1·660 | §2·360 | 2·280 | 3·369 | 1·413 | 1·492 | †·336 | †·435 | 1·660 | 2·004 | 1·704 | 3·369 | '77 | †·336 | '80 |
| FEBRUARY | 2·060 | 1·537 | 2.224 | 1·798 | 1·288 | 1·832 | 1·747 | 2·806 | 1·592 | 2·877 | 1·976 | 2·877 | '83 | 1·288 | '78 |
| MARCH | ·960 | †·830 | 2·627 | 1·724 | †·658 | ·643 | 1·259 | 1·415 | 1·206 | †·836 | †1·216 | 2·627 | '76 | ·643 | '79 |
| APRIL | ·900 | 1·690 | 3·571 | 2·9.0 | 2·303 | 3·085 | 1·911 | ·966 | 3·335 | 2·282 | 2·296 | 3·571 | '76 | ·900 | '74 |
| MAY | 1·470 | 2·056 | †·518 | 2·229 | 5·148 | 3·151 | 1·459 | ·921 | †1·056 | 1·700 | 1·971 | 5·148 | '78 | ·518 | '76 |
| JUNE | †·640 | 3·620 | 1·720 | 1·121 | 2·337 | **4·392** | 2·961 | 1·796 | 3·147 | 2·478 | 2·422 | 4·392 | '79 | ·640 | '74 |
| JULY | 1·115 | **6·970** | ·583 | 2·679 | 1·264 | 3·381 | **6·642** | 2·500 | 3·422 | 3·741 | **3·230** | **6·970** | '75 | ·583 | '76 |
| AUGUST | 1·810 | 2·654 | 2·190 | **3.438** | **5·342** | 2·867 | 1·577 | **5·067** | 1·531 | 1·195 | 2·772 | 5·342 | '78 | 1·195 | '83 |
| SEPTEMBER | **2·790** | 2·652 | 4·857 | 1·468 | 1·120 | 2·954 | 4·261 | 2·282 | 2·225 | **5·609** | 3·022 | 5·609 | '83 | 1·120 | '78 |
| OCTOBER | 2·660 | 4·998 | 1·720 | †1·077 | 2·447 | †·559 | 6·440 | 3·410 | **5·525** | 1·995 | 3·083 | 6·440 | '80 | ·559 | '79 |
| NOVEMBER | 2·435 | 4·008 | 2·974 | 2·514 | 3·544 | ·934 | 2·112 | 2·446 | 3·214 | 3·650 | 2·783 | 4·008 | '75 | ·934 | '79 |
| DECEMBER | 1·540 | 1·342 | **5·062** | 1·865 | 1·650 | 1·074 | 2·307 | 2·666 | 3·825 | 1·053 | 2·239 | 5·062 | '76 | 1·053 | '83 |
| Total for each Year | †20·049 | **34·717** | 30·326 | 26·205 | 28·534 | 26·369 | **33·012** | 26·740 | **31·788** | 29·420 | 28·715 | | | | |
| No. Rainy Days in each Year | † 164 | 178 | 183 | 194 | 175 | **195** | 192 | 177 | **195** | 184 | 184 | | | | |

In these Tables the heaviest fall in any column is distinguished by thicker type, the lowest by a †; similar distinctions are made in the lines of Yearly Totals and of number of Rainy Days. (A Rainy Day is one in which at least $\frac{1}{200}$th of an inch (or half a ton per acre) has fallen.)

* During 1874 and the early part of 1875 the third decimal figure was seldom noted.

§ In January, 1875, one heavy day's rain was lost by the accidental upsetting of the gauge.

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A comparison of the different quarters of the year gives the following results:—

| | Mean of Rainfall. | Greatest. | Year. | Least. | Year. |
|---|---|---|---|---|---|
| Jan.—March ..... | 4·896 in. | 7·131 in. | '76 | 3·342 in. | '80 |
| April—June ..... | 6·689 „ | 10·628 „ | '79 | 3·010 „ | '74 |
| July—September ... | 9·024 „ | 12·480 „ | '80 | 5·715 „ | '74 |
| Oct.—Dec. ..... | 8·105 „ | 12·564 „ | '82 | 2·567 „ | '79 |

The greater certainty of rain in the summer quarter as shewn by the high amount of the least fall is noteworthy.

During the ten years falls of one inch and upwards have been registered on 24 days; of these, 7 occurred in '75, 4 in '80 and in '83, 3 in '81, and 2 in '77, in '78, and in '82.

The heaviest fall registered in 24 hours was in May, 1878, when 1·98 in. fell between 5 p.m. on the 7th and 5 p.m. on the 8th.

The heaviest continued fall was in July, 1881, when 1·267 in. fell on the 13th, and 1·259 in. on the 14th. This caused the heavy floods which broke railway communication in the Midlands.

The heaviest rate of fall registered was on July 16, 1881, when 0·552 in. fell in 27 minutes, or at the rate of 29·44 in. (*i.e.*, decidedly in excess of the yearly average) in 24 hours.

G. H. MULLINS, M.A., F. R. Met. Soc.

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## WHITE FROST FOLLOWED BY GALES.

*To the Editor of the Meteorological Magazine.*

SIR,—I hope you will not be annoyed by my asking for an explanation of the following meteorological puzzle.

Hoar frost in autumn and spring is in this part of Ireland regarded as a sure precursor of rainy stormy weather, and I have frequently observed that the arrival of gales, *foretold by American telegraph*, is often preceded by hoar frost.

A typical instance occurred to-day, although no warning of a storm was given, and the forecast was for northerly breezes and fine weather.

Yesterday, Friday, was a dull close day with local showers. The max. temp. was 51°. The evening was gloomy, chilly, and the wind, very light, was northerly.

During the early part of the night the clouds dispersed, and as the temperature fell, thin mist rose from the S., while the surface air was moving from the N.

The minimum recorded 31°, 4 feet above ground. At sunrise the sky was almost cloudless, and a thick hoar frost lay on the grass. A very light southerly breeze was noted, and a bank of cirro-stratus was observed in the W., which gradually spread over the sky.

Between 11 and 12 a.m., a S.W. gale sprang up, and blew fitfully with slight showers till noon, when the wind backed to S.S.W. and S. From that hour until 4 p.m. the gale continued with heavy driving showers. About 5 p.m. the wind lulled, veered to W.S.W. and W., the clouds broke up, and by 5.15 p.m. the sun was shining brightly. At 6 p.m. a bank of dark nimbi hid the western horizon, and the wind was N.W.

I have minutely described this storm as it is a typical one, very like many of our autumn and spring gales.

What puzzles me is the frosty night that foretels these storms. Is there any scientific explanation of this calm, and accompanying fall of temperature, preceding a storm advancing across the Atlantic.

That a fall of temperature below 32° on a coast washed by a sea of from 50° to 55° should induce a storm is easily explained; but why does the temperature so often fall in anticipation of a storm? There may be a very simple explanation of this, but no one hereabouts can give it.—Yours truly,

JAMES WISE.

*Rostellan Castle, Co. Cork, March 10th, 1884.*

| | in. | | in. |
|---|---|---|---|
| March 7th, 6 p.m. ..... | 29·805 | March 8th, 5 p.m. ..... | 29·369 |
| ,, 7th, 10 p.m. ..... | 29·855 | ,, 8th, 6 p.m. ..... | 29·397 |
| ,, 8th, 8 a.m. ..... | 29·793 | ,, 8th, 7 p.m. ..... | 29·415 |
| ,, 8th, 12 a.m. ..... | 29·651 | ,, 8th, 9 p.m. ..... | 29·433 |
| ,, 8th, 2 p.m. ..... | 29·558 | ,, 8th, 10 p.m. ..... | 29·443 |
| ,, 8th, 4 p.m. ..... | 29·456 | | |

| | | | |
|---|---|---|---|
| March 7th ..... | Max. 51° ..... | Min. 45° ..... | Rainfall 0·04 |
| ,, 8th ..... | ,, 46° ..... | ,, 31° ..... | ,, 0·23 |
| ,, 9th ..... | ,, 46° ..... | ,, 34° ..... | ,, |

[Considering that a satisfactory reply to this question would be of

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public utility, we forwarded the letter to the Hon. Ralph Abercromby, and have been favoured with the following clear and interesting reply.—ED.]

*To the Editor of the Meteorological Magazine.*

SIR,—The calm, frosty night which often precedes a gale, to which your correspondent, Mr. Wise, alludes, is well known and forms the subject of several popular prognostics.

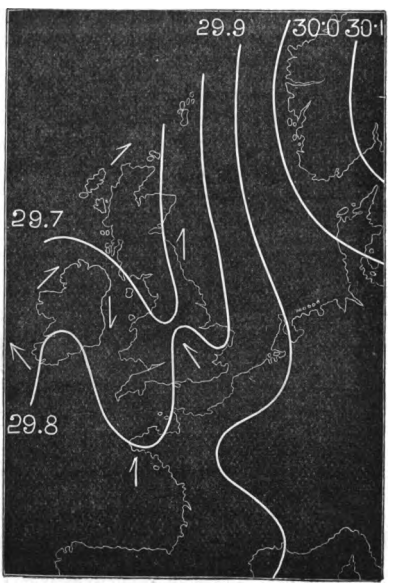
The explanation is very simple, though it is only within the last few years that it has been possible to give the true solution.

The greater portion of all our wind and rain comes from the action of cyclones, and one large class of these is always preceded by a curious wedge-shaped patch of high pressure, just as some big waves are preceded by a small ripple.

In this wedge of high pressure the air is calm, and the sky always clear. This is the primary condition; the cold is secondary. During the greater part of the year, a calm air and clear sky give full play to the radiation of the season, and white frost is deposited during the night. As the day goes on the cyclone, of which the wedge is as it were the satellite, comes on with wind and rain.

We may, therefore, give the answer to your query thus—a frosty night sometimes precedes wind and rain, because many cyclones develope an area of calm and clear sky in front of, and as a portion of, themselves.

But perhaps all this will be more intelligible to those who are unfamiliar with the modern methods of handling questions about weather, if we give an illustration of the isobars on the day to which

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your correspondent refers. In the figure I therefore give the isobars and a few wind arrows, at 8 a.m. on Saturday, March 8th, 1884. We will confine our attention to the isobar of 29·8 inches only. In that line we see a loop of lower pressure over Cornwall; this is a secondary cyclone. In front of this there is a small wedge of higher pressure nearly over Oxford. Over the south of Ireland there is another larger wedge, and if we could have seen further out into the Atlantic, we should have found another small cyclone to the west of Valentia.

The frost which Mr. Wise observed was due to the action of this second wedge, and the gale which followed later on in the day was caused by the cyclone coming in from the Atlantic. In the course of the day some complications occurred, which gave rise to the apparently irregular backing of the wind. These, however, though all explicable, would take too much space if I were to endeavour to detail them.

A full account of the weather in wedges of high pressure, and of the prognostics which are associated with them, will be found in the Quarterly Journal of the Royal Meteorological Society, vol. ix., p. 27, "Abercromby and Marriott on Popular Weather Prognostics."

Yours sincerely,

RALPH ABERCROMBY.

*21, Chapel Street, Belgrave Square, London, S.W.*
*March 12th, 1884.*

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## COLONEL WARD'S LETTER ON THE SUNSETS.

We have been requested by Col. Ward to make it known that the letter published upon page 22 of this volume was a private letter, and was not intended for publication.

Considering that the letter in question was the only one received from Col. Ward, and that in the first paragraph of it he said, "I hasten to reply to your note appended to my letter," *i.e.*, to the note on page 10 of this volume, we at once accepted it as his formal reply; but we have complied with his latest wish.

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## THE AMERICAN METEOROLOGICAL JOURNAL.

We hear with extreme pleasure that we may soon expect to receive the first number of the above periodical. It will be edited by Prof. M. W. Harrington of the Detroit Observatory, and he will be assisted by some of the most able meteorologists in the States. The effort has our warmest approval, and we venture to suggest that European meteorologists might with advantage put "The American Meteorological Journal, Detroit Observatory, Ann Arbor, Michigan," on their list of exchanges.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1883.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 75·3 | 18 | 41·4 | 28 | 66·7 | 50·2 | 53·0 | 84 | 120·7 | 35·4 | 3·83 | 18 | 6·0 |
| Malta | 93·0 | 3 | 62·9 | 29 | 80·5 | 67·1 | 63·8 | 71 | 143·9 | ... | ·38 | 5 | 2·3 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 76·6 | 18 | 58·5 | 9 | 74·9 | 64·7 | 59·7 | 71 | ... | ... | 1·07 | 13 | 5·9 |
| Calcutta | 90·7 | 24 | 75·2 | 30 | 87·8 | 78·4 | 78·2 | 87 | 159·3 | 70·3 | 6·96 | 20 | 8·2 |
| Bombay | 84·9 | 19 | 73·5 | 23 | 83·0 | 75·2 | 74·9 | 87 | 147·2 | 68·9 | 12·37 | 24 | 8·7 |
| Ceylon, Colombo | 87·7 | 14 | 74·8 | 20 | 85·9 | 77·9 | 72·4 | 73 | 146·0 | 69·0 | 3·30 | 7 | 8·2 |
| *Melbourne* | 76·2 | 11 | 36·4 | 29 | 61·9 | 44·8 | 42·9 | 71 | 129·4 | 26·4 | 1·64 | 12 | 5·9 |
| *Adelaide* | 76·3 | 30 | 40·9 | 5 | 62·6 | 46·3 | 43·7½ | 67 | 139·8 | 31·5 | 1·86 | 20 | 4·6 |
| *Wellington* | 60·0 | 5 | 34·3 | 19 | 54·2 | 43·9 | ... | ... | 125·0 | 32·0 | 3·72 | 20 | ... |
| *Auckland* | 65·0 | 4 | 41·0 | 11, 13 | 60·7 | 47·3 | 44·1 | 69 | 137·0 | 33·5 | 1·84 | 15 | 5·9 |
| *Falkland Isles* | 51·0 | 10 | 26·9 | 13 | 44·1 | 35·7 | 35·4 | 86 | 113·0 | 25·8 | 1·43 | 20 | 7·1 |
| Jamaica | 90·3 | 6 | 71·7 | 16 | 88·0 | 74·0 | 74·5 | 84 | ... | 66·5 | 3·63 | ... | 7·7 |
| Barbados | 84·0 | 5,9* | 70·0 | 29 | 82·0 | 73·0 | 74·5 | 84 | 152·0 | 63·0 | 7·04 | 20 | 6·0 |
| Toronto | 75·1 | 1 | 33·4 | 4 | 63·5 | 45·6 | 48·5 | 76 | 133·5 | 27·0 | 2·38 | 14 | 5·3 |
| New Brunswick, Fredericton | 80·7 | 13 | 29·0 | 29 | 68·4 | 42·3 | 45·6 | 73 | ... | ... | 1·71 | 8 | 4·5 |
| Manitoba, Winnipeg | 82·1 | 12 | 19·0 | 30 | 63·6 | 39·2 | 41·7 | 75 | ... | ... | 1·25 | 6 | 5·2 |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 29

### REMARKS, SEPTEMBER, 1883.

MALTA.—Mean temp. 73°·9, mean pressure 29·998 in.; average velocity of wind, 10·2 miles; temp. of sea ranged from 79°·5 to 74°·0; severe TS on 13th.—J. SCOLES.

*Mauritius.*—Rainfall ·55 in. below, and mean temp. 0°·1 above the average; mean pressure 30·194 in.; mean hourly velocity of wind 12·3 miles, extremes 27·6 miles and 1·6 miles, prevailing direction E.S.E. The clouds and sky at sunrise and sunset were coloured more frequently and to a greater extent than usual; probably partly due to the presence in the air of volcanic dust from Sunda. C. MELDRUM, F.R.S.

COLOMBO.—No TSS occurred during the month; from the 8th until about the 15th the rising and the setting of the sun was of an unusual green colour. J. STODDART.

*Melbourne.*—Mean temp. of air and of dewpoint each 0°·7 below the average; mean pressure humidity and amount of cloud all about the average; rainfall ·72 in. below it; prevailing direction of wind S.W. and S.; strong breezes on 5 days; heavy squalls on 3rd, 4th and 5th; heavy dew on 9 days; thick fog on 16th; hoar frost on 29th; sheet L on 18th; T and L on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide.*—This month was the coldest September (with one exception) during 26 years, the mean temp., 54°·4, being nearly 3° below the average, while the max. was only 76·3; the amount of cloud was rather less, and the rainfall slightly in excess of the average. C. TODD.

*Wellington.*—On the whole a showery month, though with some fine bright days; prevailing winds S.E., at times squally; cold towards the end of the month, with H on 17th and 30th, and S on hills on the latter day, slight earthquake on 27th; mean pressure ·057 in. above, and mean temp. 2°·2 below the average. R. B. GORE.

*Auckland.*—Weather generally fine, with unusually small rainfall, not half the average; mean pressure and temp. above the average. T. F. CHEESEMAN.

BARBADOS.—Mean temp. 76°·7, slightly above the average; mean hourly velocity of wind 7·5 miles, extremes 12·9 miles and 3·2 miles; rainfall 19 per cent. below the average; 10 days were overcast and clouded; TS on 16th; the sun appeared various colours on the evening of the 15th, and morning of 16th. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·29 | XI. | Carno, Tybrith ... ..... | 3·39 |
| ,, | Margate, Birchington... | 1·08 | ,, | Corwen, Rhug ..... | 2·95 |
| ,, | Littlehampton ..... | 1·84 | ,, | Port Madoc ..... | 3·64 |
| ,, | Hailsham ..... | 2·31 | ,, | I. of Man, Douglas ..... | 3·21 |
| ,, | I. of W., St. Lawrence. | 1·84 | XII. | Stoneykirk, Ardwell Ho. | 3·02 |
| ,, | Alton, Ashdell..... | 2·55 | ,, | Melrose, Abbey Gate... | 2·46 |
| III. | Winslow, Addington ... | 1·42 | XIII. | N. Esk Res. [Penicuick] | 2·40 |
| ,, | Oxford, Magdalen Col... | 1·41 | XIV. | Ayr, Cassillis House ... | 2·23 |
| ,, | Northampton ..... | 1·27 | ,, | Glasgow, Queen's Park. | 2·29 |
| ,, | Cambridge, Beech Ho... | ·69 | XV. | Islay, Gruinart School.. | 4·26 |
| IV. | Southend ..... | 1·07 | XVI. | St. Andrews, Newton Bk | 2·87 |
| ,, | Harlow, Sheering ... .. | 1·46 | ,, | Balquhidder, Stronvar.. | 7·94 |
| ,, | Diss ..... | 1·25 | ,, | Dunkeld, Inver Braan.. | 4·90 |
| ,, | Swaffham ..... | 1·35 | ,, | Dalnaspidal H.R.S. ... | 4·14 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 2·50 |
| V. | Salisbury, Alderbury... | 2·49 | ,, | Forres H.R.S. ..... ... | 1·05 |
| ,, | Warminster ..... | 3·09 | XVIII. | Strome Ferry H.R.S.... | 4·98 |
| ,, | Calne, Compton Bassett | 2·27 | ,, | Lochbroom ..... | 3·61 |
| ,, | Ashburton, Holne Vic.. | 7·76 | ,, | Tain, Springfield..... | 1·35 |
| ,, | Holsworthy, Clawton... | 3·27 | ,, | Loch Shiel, Glenaladale | 8·64 |
| ,, | Lynmouth, Glenthorne. | 3·80 | ,, | Invergarry ..... | 4·58 |
| ,, | Probus, Lamellyn ..... | 3·81 | XIX. | Lairg H.R.S. ..... | 1·64 |
| ,, | Wincanton, Stowell Rec. | 2·97 | ,, | Forsinard H.R.S. ..... | 2·67 |
| ,, | Taunton, Fullands ..... | 1·76 | ,, | Watten H.R.S. ..... | 2·52 |
| VI. | Bristol, Clifton ..... .. | 2·69 | XX. | Dunmanway, Coolkelure | 9·57 |
| ,, | Ross ..... | 2·62 | ,, | Fermoy, Gas Works ... | 3·65 |
| ,, | Wem, Sansaw Hall..... | 1·84 | ,, | Tralee, Castlemorris ... | 5·16 |
| ,, | Cheadle, The Heath Ho. | 2·24 | ,, | Tipperary, Henry Street | 3·23 |
| ,, | Worcester, Diglis Lock | 2·49 | ,, | Newcastle West ..... | 2·42 |
| ,, | Coventry, Coundon ..... | 2·31 | ,, | Miltown Malbay..... | 4·33 |
| VII. | Melton, Coston ..... | 1·36 | ,, | Corofin ..... | 4·48 |
| ,, | Ketton Hall [Stamford] | 1·01 | XXI. | Carlow, Browne's Hill.. | 2·88 |
| ,, | Horncastle, Bucknall ... | 1·37 | ,, | Navan, Balrath ..... | 1·87 |
| ,, | Mansfield, St. John's St. | 2·49 | ,, | Mullingar, Belvedere ... | 2·69 |
| VIII. | Macclesfield, The Park. | 2·58 | ,, | Athlone, Twyford ..... | 5·02 |
| ,, | Walton-on-the-Hill..... | 2·65 | XXII. | Galway, Queen's Col.... | 3·52 |
| ,, | Lancaster, South Road. | 3·34 | ,, | Clifden, Kylemore ..... | ... |
| ,, | Broughton-in-Furness .. | 5·31 | ,, | Crossmolina, Enniscoe.. | 5·89 |
| IX. | Wakefield, Stanley Vic. | 1·20 | ,, | Carrick-on-Shannon ... | 5·66 |
| ,, | Ripon, Mickley ..... | 2·61 | XXIII. | Dowra ..... | .. |
| ,, | Scarborough..... | 2·16 | ,, | Rockcorry..... | 1·77 |
| ,, | East Layton [Darlington] | 3·16 | ,, | Warrenpoint ..... | 4·17 |
| ,, | Middleton, Mickleton .. | 1·83 | ,, | Newtownards ..... | 2·12 |
| X. | Haltwhistle, Unthank.. | 2·06 | ,, | Belfast, New Barnsley . | 3·87 |
| ,, | Shap, Copy Hill ..... | 5·31 | ,, | Cushendun ..... | 4·22 |
| XI, | Llanfrechfa Grange ..... | 3·73 | ,, | Bushmills ..... ..... | 3·01 |
| ,, | Llandovery ..... | 3·83 | ,, | Stewartstown ..... | 3·47 |
| ,, | Solva ..... | ... | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 5·76 | ,, | Buncrana ..... | 2·44 |
| ,, | Rhayader, Nantgwillt.. | 5·51 | ,, | Carndonagh ..... | 3·83 |

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# MARCH, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg | Min. Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) | 1·40 | — ·21 | ·56 | 10 | 7 | 68·0 | 16 | 27·5 | 1 | 4 | 10 |
| II. | | Maidstone (Hunton Court) | 1·41 | — ·17 | ·63 | 10 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 1·58 | + ·18 | ·59 | 3 | 9 | 67·4 | 16 | 25·3 | 3 | 9 | 12 |
| III. | | Hitchin | 1·18 | — ·30 | ·45 | 3 | 7 | 68·0 | 17 | 26·0 | 2 | 11 | ... |
| ,, | | Banbury | 1·76 | + ·16 | ·63 | 3 | 10 | 64·0 | 16*a* | 26·0 | 3 | 11 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·95 | — ·61 | ·33 | 10 | 10 | 66·0 | 17 | 25·0 | 27 | 10 | ... |
| ,, | | Norwich (Cossey) | 1·31 | — ·38 | ·35 | 10 | 13 | 69·0 | 16 | 25·5 | 1, 28 | 9 | 11 |
| V. | | Weymouth(LangtonHerring) | 2·69 | ... | 1·35 | 3 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 3·65 | + 1·16 | ·74 | 3 | 18 | 65·5 | 16 | 33·0 | 24 | 0 | ... |
| ,, | | Bodmin | 5·07 | + 1·91 | 1·29 | 3 | 16 | 58·0 | 15*b* | 32·0 | 11 | 1 | 8 |
| VI. | | Cirencester | 2·46 | + ·39 | ·91 | 3 | 17 | .. | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·15 | + ·99 | ·75 | 4 | 19 | 64·0 | 16 | 30·0 | 26 | 9 | 13 |
| ,, | | Tenbury (Orleton) | 2·86 | + ·99 | ·69 | 3 | 15 | 66·7 | 16 | 26·0 | 3 | 11 | 13 |
| VII. | | Leicester | 1·62 | ... | ·50 | 3 | 11 | 69·3 | 16 | 28·8 | 24 | 4 | 22 |
| ,, | | Boston | 1·10 | — ·19 | ·43 | 2 | 11 | 68·0 | 16 | 30·0 | 1 | 4 | ... |
| ,, | | Grimsby (Killingholme) | 1·39 | — ·27 | ·28 | 4 | 14 | 63·5 | 17 | 31·0 | 1,3 | 2 | ... |
| ,, | | Hesley Hall [Tickhill] | 1·46 | ... | ·42 | 3 | 9 | 69·0 | 16 | 24·0 | 1 | 10 | ... |
| VIII. | | Manchester (Ardwick) | 2·22 | — ·23 | ·61 | 4 | 12 | 64·0 | 16*a* | 30·0 | 2 | 3 | ... |
| IX. | | Wetherby (Ribston Hall) | 1·93 | — ·20 | ·74 | 5 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 4·07 | — ·69 | 1·02 | 4 | 17 | 66·0 | 17 | 29·0 | 1, 21 | ... | ... |
| X. | | North Shields | 2·34 | + ·89 | ·89 | 4 | 12 | 63·5 | 17 | 27·8 | 3 | 7 | 9 |
| ,, | | Borrowdale (Seathwaite) | 13·98 | + 4·09 | 3·27 | 14 | 20 | 66·0 | 16 | 28·6 | 11 | 5 | ... |
| XI. | WALES. | Cardiff (Ely) | 3·87 | + 1·18 | 1·41 | 3 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest | 5·08 | + 1·89 | ·91 | 2 | 18 | 59·5 | 16 | 27·5 | 23 | 5 | 10 |
| ,, | | Plinlimmon (Cwmsymlog) | 3·31 | ... | ·60 | 10 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 2·12 | + ·24 | ·71 | 4 | 12 | 67·5 | 16 | 30·0 | 11 | ... | ... |
| XII. | | Cargen [Dumfries] | 4·19 | + 1·41 | ·84 | 14 | 18 | 63·4 | 16 | 27·4 | 11 | 5 | ... |
| ,, | | Hawick | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 3·18 | + ·04 | ·59 | 9 | 17 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory) | 4·97 | + ·36 | ·83 | 19 | 24 | 54·0 | 17 | 27·0 | 9, 10 | 12 | ... |
| ,, | | Oban (Craigvarren) | 4·36 | ... | ·59 | 6 | 21 | 62·0 | 16*a* | 30·5 | 1 | 1 | ... |
| ,, | | Mull (Quinish) | 5·98 | ... | 1·01 | 6 | 23 | ... | ... | ... | ... | ... | ... |
| XVI. | SCOTLAND. | Loch Leven Sluices | 2·60 | + ·48 | ·50 | 10 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath | 2·88 | + 1·25 | ·55 | 9 | 15 | 53·0 | 17 | 30·0 | 11 | 5 | ... |
| XVII. | | Braemar | 5·88 | + 3·69 | 1·16 | 10 | 18 | 59·4 | 16 | 24·0 | 10 | 14 | 27 |
| ,, | | Aberdeen | 3·40 | ... | ·74 | 8 | 21 | 57·0 | 17 | 31·0 | 10*c* | 4 | ... |
| XVIII | | Skye (Sligachan) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden | 1·36 | — ·39 | ... | ... | ... | 63·0 | 16 | 30·5 | 3, 27 | 8 | 22 |
| XIX. | | Dunrobin | 1·80 | ... | ·48 | 9 | 12 | 58·5 | 16 | 29·0 | 10 | 8 | ... |
| ,, | | Orkney (Sandwick) | 3·63 | + ·99 | ·53 | 8 | 15 | 55·8 | 17 | 29·2 | 11 | 1 | 9 |
| XX. | | Cork (Blackrock) | 5·13 | + 2·37 | ·59 | 10 | 20 | 61·0 | 23 | 29·0 | 7*d* | 4 | .. |
| ,, | | Dromore Castle | 7·10 | ... | 1·70 | 6 | 22 | 60·0 | 14 | 32·0 | 29 | ... | ... |
| ,, | IRELAND. | Waterford (Brook Lodge) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Killaloe | 4·34 | ... | ·87 | 6 | 21 | 59·0 | 16 | 23·0 | 10 | 6 | ... |
| XXI. | | Portarlington | 1·20 | — ·96 | ·32 | 2 | 23 | 59·5 | 16 | 29·5 | 10 | 5 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·86 | — ·13 | ·47 | 9 | 17 | 61·1 | 16 | 31·2 | 11 | 1 | 6 |
| XXII. | | Ballinasloe | 3·35 | + ·97 | ·53 | 6 | 22 | 55·0 | 17 | 27·0 | 30 | 7 | ... |
| XXIII | | Waringstown | 2·53 | + ·47 | ·42 | 30 | 17 | 63·0 | 16 | 25·0 | 10 | 5 | 10 |
| ,, | | Londonderry (Creggan Res.) | 2·48 | ... | ·34 | 30 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) | 2·79 | + ·70 | ·41 | 2 | 24 | 61·0 | 16 | 28·0 | 10 | 5 | ... |

+ Shows that the fall was above the average; — that it was below it.
*a* And 17. *b* And 16, 22. *c* And 21. *d* And 8, 9, 10.

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# METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.- A very favourable month for tillage operations; salutary cold winds dried the clay fallows, and if the weather was less genial it was decidedly more seasonable; lambing season very favourable. Blackthorn in flower on 3rd, horse chestnut in leaf on 22nd, peacock butterfly seen on 5th, tadpoles on 15th.

BANBURY.—Mean temp. 42°·7, a little above the average; high wind on 21st and 31st; fog on 12th and 25th; lunar rainbow at 8.20 p.m. on 12th.

CULFORD.—A remarkably dry and fine month; R much wanted, pheasants commenced laying, and fruit trees looked very promising at the close of the month.

LANGTON HERRING.—From 10th to 30th the weather was very fine: farmers could not have had a more favourable season for ploughing, spring sowing, &c.; mean temp. above the average; solar halos were seen on 5 days; fog on 18th and 19th.

BODMIN.—A singularly mild March; we have literally had no winter. A heavy but brief gale with torrents of R occurred on the 31st, lasting from 6 p.m. to midnight.

WOOLSTASTON.—The first and last weeks of the month were very cold with easterly winds; the middle of the month was warm and genial; mean temp. 41°·9; S fell on 2nd; a strong gale occurred on the night of the 31st.

ORLETON.—The temp. was low till the 12th, with frost almost every night; S fell on 1st and 3rd, and heavy R on 3rd and 4th; it then became warmer, and continued so till the 24th with fine days and much sunshine; the remainder of the month was cloudy, cold, and sunless, with N.E. wind. The mean temp. of the month was 1°·3 above the average of 23 years; apricots and peaches blossomed about the 19th, and damson trees about the 23rd.

LEICESTER.—A dry month, at times warm for the season; R was needed at the close both for the fields and gardens, but in both the prospect was promising.

KILLINGHOLME.—The month opened with cold weather, but there were some very fine days in the middle; the latter part was cool and dry, and R was wanted at the close.

ARDWICK.—March was on the whole a fine open month, E. wind prevailed for some time, but was not so cold as on other occasions; vegetation is very forward, and we shall this year have a green Easter.

## WALES.

HAVERFORDWEST.—The month as a whole was unusually wet; it commenced cold, stormy and very wet, and some of the heaviest floods of the winter occurred during the first three days. A cold, easterly blast prevailed from the 28th to the end of the month, drying up all the moisture in an almost miraculous manner, and the sudden fall of temp. which accompanied it caused much sickness.

LLANDUDNO.—The weather generally was fine and seasonable; up to the 10th it rained more or less on every day but two; from the 10th till within two days of the close of the month the weather was generally dry and most favourable for agricultural operations; mean temp. nearly 1°·5 above the average; mean daily range slightly below, and total range considerably above the average.

## SCOTLAND.

CARGEN.—A very dull month, only 68 hours of sunshine, the average being 135 hours; it was very wet up to the 20th, and farming operations were much

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impeded in consequence; mean temp. 1°·1 above the average; S on 3rd; gale on 20th.

OBAN.—The month on the whole was very fair; the temp. increased rapidly from 5th to 17th, and on the latter day occurred the highest reading known in March for many years; thereafter easterly winds set in, and normal weather prevailed to the close of the month. S on 4 days; H on 3 days; heavy gale with T and H on 19th.

ABERDEEN.—Rainfall greatly above the average for the month; strong gales occurred from various directions with heavy showers, giving an unsettled character to the weather till the 23rd, after which date dry weather prevailed for about a week; but strong S.E. winds, again accompanied by heavy R, blew on 30th and 31st; aurora on 28th; and L on 18th.

SANDWICK.—The temp. of the month was mild, but there were gales of 50 miles an hour on the 8th, 9th, 19th and 20th, and one of 60 miles an hour on 10th. The ground was white with S on 10th, and snow rollers were formed on 12th.

## IRELAND.

BLACKROCK.—During the month there were few days without R, and the winds were very variable.

KILLALOE.—R fell on very many days for March, with very cold S.E. winds, and not a particle of March dust was visible; agriculture, therefore, was tedious and late; S on 9th, 10th, and 11th.

DUBLIN, FITZWILLIAM SQUARE.—The weather was generally favourable, and an exceptionally dry period lasted from the 13th to 31st, the rainfall not amounting to one-tenth of an inch. Unusual warmth for the time of the year prevailed between the 14th and 19th; the mean temp. of the month, 44°·9, was about 2° above the average of twenty years; sleet or S occurred on 10th and 31st, H on 20th and 31st, fog on 4th and 24th; the wind blew freshly or strongly on 12 days.

BALLINASLOE.—The month was wet and rough, but not so cold as usual, and there was little E. wind; a heavy fall of S occurred between 11 p.m. on 30th, and 6 a.m. on 31st.

EDENFEL.—Another very mild month, but 24 days with R, and no drying winds, resulted in a most backward seed-time; the mean temp. on the 16th, 55°, is higher than that of any other day in March for more than 20 years.

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## ERRATA IN METEOROLOGICAL MAGAZINE, 1883.

We are glad to be able to state that up to the present time the following are all the errata detected by comparing the annual summaries for 1883 with the records as published monthly. There are twelve errors, and as there are about 3,000 entries in the tables, this gives about one wrong entry to 249 right ones. This, though better than last year, is still below the accuracy which is reached in the annual volume of *British Rainfall*.

### REGULAR TABLE.

| | in. | | in. |
|---|---|---|---|
| Bodmin, July, should be .. ..... | 5·01 | Haverfordwest, Aug., should be | 2·36 |
| Haverfordwest, max. fall, April | ·85 | Newmains, December ..... | 5·25 |

### SUPPLEMENTARY TABLE.

| | in. | | in. |
|---|---|---|---|
| Beaminster, July, should be..... | 3·57 | Mickleton, Jan., should be..... | 8·93 |
| Coundon, August ..... | 1·06 | ,, April ..... | 2·19 |
| ,, September ..... | 5·51 | Mullingar, Belvedere, Feb..... | 3·83 |
| Macclesfield, August ..... | 2·78 | ,, ,, Sept. ... | 4·39 |

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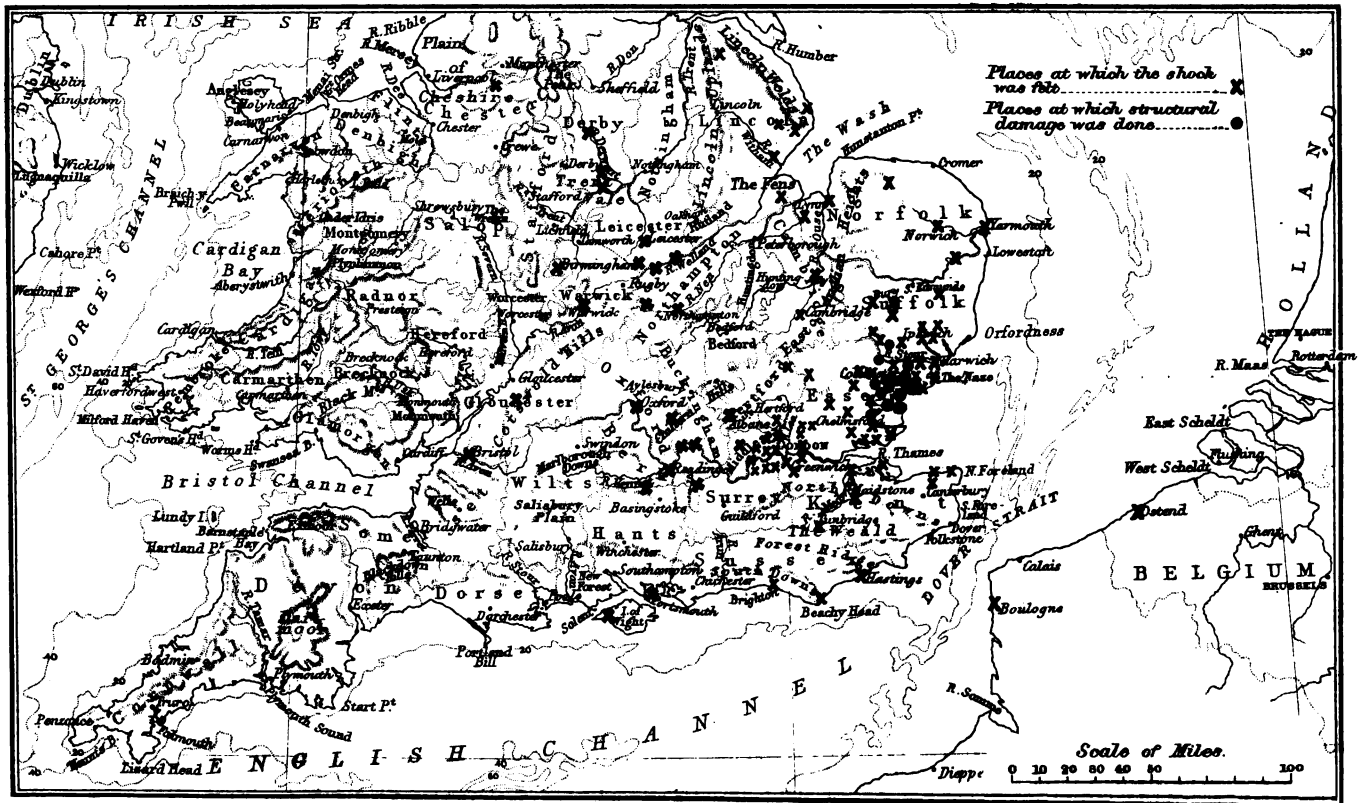
# GENERAL MAP OF AREA OVER WHICH THE EARTHQUAKE OF APRIL 22ND 1884 WAS FELT.




Stanford's Geog.l Estab.t London.

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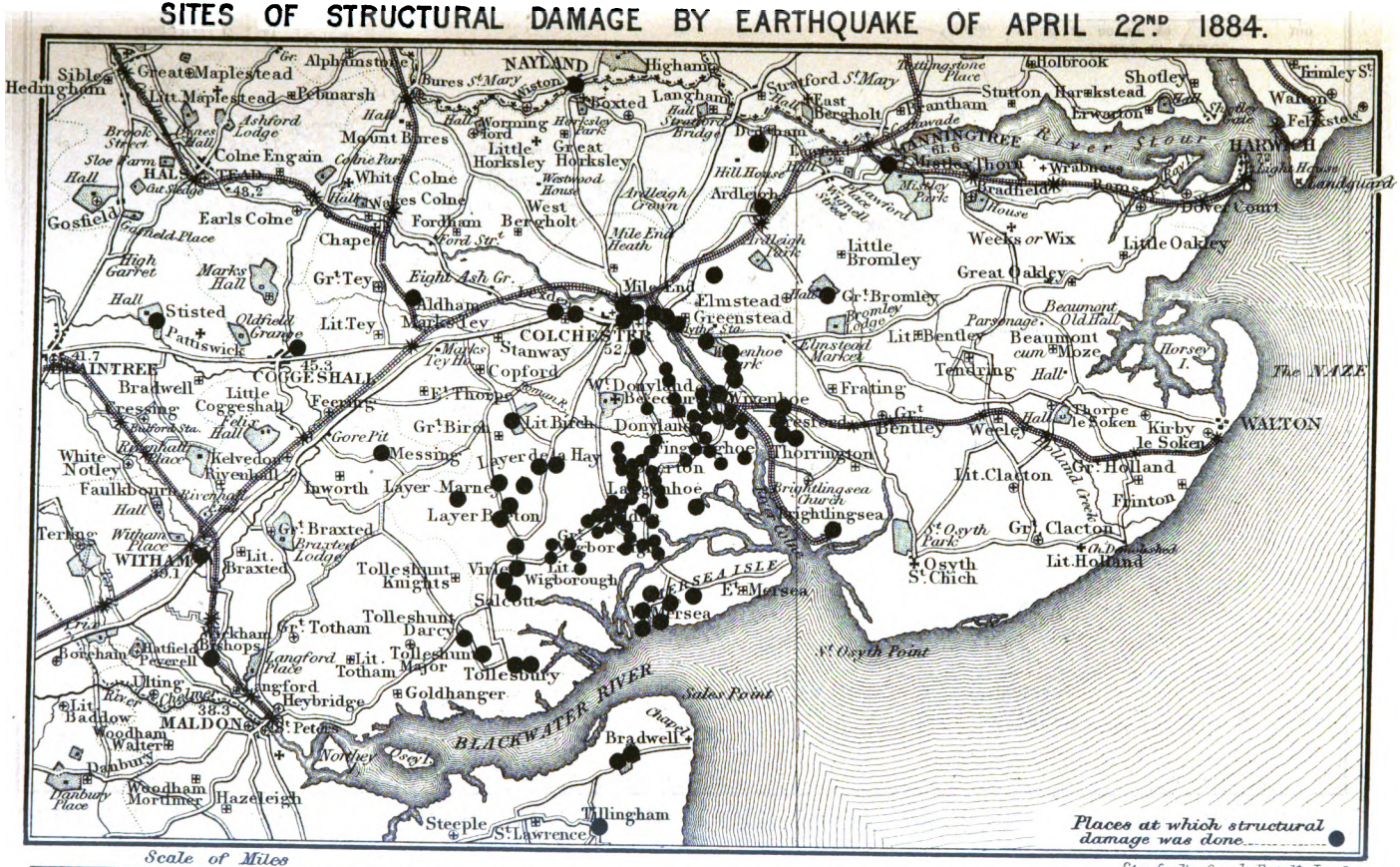
# SITES OF STRUCTURAL DAMAGE BY EARTHQUAKE OF APRIL 22ND 1884.


NAYLAND
COLCHESTER
COGGESHALL
BRAINTREE
WITHAM
MALDON
WALTON
HARWICH
TENDRING
SEASIDE
BLACKWATER RIVER
The NAZE
St Osyth Point
Sales Point
Bradwell
Tillingham
Steeple
Osyth
Thorrington
Frating
Weeley
Lit Clacton
Gt Clacton
Lit Holland
Gt Holland
Frinton
Walton
Kirby le Soken
Thorpe le Soken
Beaumont cum Moze
Tendring
Lit Bentley
Gt Bentley
Gt Bromley
Lit Bromley
Great Oakley
Little Oakley
Weeks or Wix
Dovercourt
Ramsey
Wrabness
Bradfield
Manningtree
Mistley
Lawford
Ardleigh
Elmstead
Greenstead
Mile End
Wivenhoe
Alresford
Donyland
Lit Birch
Gt Birch
Layer de la Haye
Layer Marney
Inworth
Messing
Kelvedon
Feering
Coggeshall
Stisted
Bradwell
Faulkbourne
Witham
Braxted
Tollesbury
Tolleshunt Darcy
Tolleshunt Knights
Goldhanger
Heybridge
Maldon
Danbury
Woodham Walter
Woodham Mortimer
Hazeleigh
Althorne
Southminster
Burnham
Dengie
Mersea
Peldon
Abberton
Layer Breton
Salcott
Virley
Wigborough
Boxted
Langham
Dedham
Stratford St Mary
East Bergholt
Holbrook
Stutton
Harkstead
Shotley
Erwarton
Felixstowe
Walton
Trimley St
Ipswich
Colchester
Great Horkesley
Little Horkesley
Fordham
Chappel
Earls Colne
White Colne
Colne Engain
Halstead
Gosfield
Sibley Hedingham
Great Maplestead
Little Maplestead
Belmarsh
Alphamstone
Bures St Mary
Mount Bures
Pattiswick
Gt Tey
Lit Tey
Aldham
Marks Tey
Copford
Stanway
Eight Ash Gr
Mile End Heath
Ardleigh Green
Ardleigh Park
Lawford Place
Mistley Park
Manningtree
River Stour
Harwich Light House
Landguard
Beaumont Old Hall
Horsey I.
Parsonage
Bromley Lodge
Elmstead Market
Wivenhoe Park
Donyland Park
Brightlingsea Church
Brightlingsea
St Osyth Park
Old Decoy
Hall Creek
Flag Creek
Lit Oakley
Gt Oakley
Wix
Tendring Hall
Weeley Hall
Thorpe Hall
Le Soken
Kirby Le Soken
Frinton
Lit Holland
Gt Clacton
Lit Clacton
St Osyth
St Chich

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SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CCXX.] MAY, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE GREAT ENGLISH EARTHQUAKE.

WE are not in the habit of employing strong adjectives, they would be out of place in these pages; as however, during the nineteen years that the *Meteorological Magazine* has been in existence we have had to report the occurrence of several English Earthquakes, and never one which could be compared with that of April 22nd, 1884, we have called it "great," as the only appropriate distinction.

It may be well to give a list of these little shocks for the convenience of reference.

1866. Sept. 13th.—East Budleigh, Sidmouth, Devon. Windows rattled. Vol. I., p. 82.

1867. Feb. 23rd.—Ambleside, Westmoreland. Houses, windows and crockery shaken for several miles round. Vol. II., p. 21.

1868. Jan. 4th.—Wellington, Somerset. Houses and beds shaken in several parts of Somerset. Vol. III., p. 12.

1868. Oct. 30th.—Monmouthshire. Three chairs were reported to be overturned in a house near Monmouth, but there is no record of actual structural damage. This shock was felt in London, the Isle of Wight, and generally in the W. of England from Cornwall to Leicester. A map of the area over which it was felt is given. Vol. III., pp. 153 and 201.

1869. March 15th.—South Lancashire and Yorkshire. This produced two instances of structural damage, a wall was cracked and one chimney was thrown down. Vol. IV., p. 37.

1871. March 17th.—North Lancashire. Felt generally from the centre of England to the South of Scotland, but no structural damage reported. Vol. VI., pp. 32 and 37.

1873. April 29th.—Doncaster. A vibration felt almost exclusively in the town of Doncaster. Possibly an earthquake, possibly not. Vol. VIII., p. 79.

1875. Sept. 23rd.—North West Yorkshire. Slight local tremor, no damage. Vol. X., pp. 143 and 154.



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1878. Jan. 28th.—South East England and France. This was felt at many places between London and the Pyrenees; it was recorded on the magnetographs at Kew Observatory, and in Dorset and Jersey it caused bells to ring, but no structural damage is reported. Vol. XIII., pp. 2 and 26.

1883. June 25th. Devon and Cornwall. Very slight shock, and no structural damage. Vol. XVIII., p. 89.

From the above list it will be seen that during nearly twenty years the entire damage reported was one wall cracked and one chimney overthrown. It is not easy to imagine a greater contrast than that statement, and the present condition of the little town of Wivenhoe.

It is difficult to decide upon the mode of adequately reporting the facts respecting the recent shock within the space which we can here devote to it.

We should like to give a list of all known British Earthquakes in which actual structural damage was done, but the compilation of such a list will take both time and space, and must therefore be deferred. It may, however, be well at once to place upon record along with the shock of 1884 that of September 8th, 1692, of which we have records from Coggeshall, from Colchester, and from Ipswich.

The following extract from "Bufton's Diary" is quoted by the Rev. Bryan Dale, in his "Annals of Coggeshall":—

"1692. September 8th being Thursday and the same day that Jacob Cox dyed, about 2 o'clock there was an Earthquake at Coxall and many towns beside hereabouts and at London and several other Countries we heard and ye news-letter said it was at ye same time in Holland and ye rest of ye provinces in ye Netherlands—I was in our garret at that time and heard ye house crack and perceived it shake and was afraid it would fall and therefore ran down-stairs."

The Rev. A. Jeffery writes respecting the same earthquake:—

"As far as I am aware, the only other earthquake of which there is any record in the annals of Ipswich took place about two o'clock on the afternoon of Thursday, September 8th, 1692, as recorded by the Rev. John Langston, the first minister of Tacket-street Chapel. In this earthquake, which was felt throughout the East of England, 1,500 of the inhabitants of Port Royal, in Jamaica, perished, being buried beneath the ruins of their own dwellings. Mr. Langston states that the earthquake was preceded by an unusually severe thunderstorm, on August 13th. This information is given in the minute-book of Tacket-street Chapel, which (through the courtesy of Mr. T. Conder, of Christchurch-street) I happen to have in my possession at the present moment for purposes of research."

On reference to Cromwell's "History of Colchester," we find that St. Peter's Church was severely shaken by an earthquake in 1692, the particulars of which are recorded in the parish register, under the hand of the Rev. Robert Dickman, then vicar. The entry is:—

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"September 8th, 1692, there happened, about 2 of the clock in the afternoon, for the space of a minute or more, an universal earthquake all over England, France, Holland, and some parts of Germany. And particularly it was attested to me by the masons that were there a-plaistering the steple of St. Peter's, in this town, and upon the uppermost scaffold, that the steple parted so wide in the midst that they could have put their hand into the crack or cleft, and immediately shut up close again, without any damage to the workmen (who expected all would have fallen down) [or to the steple itself. Most of the houses here and elsewhere shook, and part of a chimney fell down on North Hill; and very many who were sensible of it were taken at the same time with a giddiness in their head for some short time. In witness of what is here related, I have hereto set my hand. ROBERT DICKMAN, Minister of St. Peter, Colchester."

Though from this extract it appears that the convulsion took a much wider area than the present visitation, it is evident that the shock recorded in such quaint language by the Rev. Robert Dickman was not nearly so disastrous as the present one.

Immediately upon hearing of the earthquake of April 22nd, 1884, a letter was sent to the *Times*, specifying some of the features respecting which information was most required, and arrangements were made for an examination of the locality on April 24th, but though scarcely 48 hours had elapsed, many of the tottering stacks had been taken down, and bricklayers were at work in all parts of the district, repairing it is true, but also destroying valuable evidence as to the direction of the shock. Much, however, still remained, and the observations then made will be subsequently discussed; meanwhile we insert a brief record of what was seen.

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## NOTES OF AN INSPECTION OF THE DAMAGE ON THE ROADS FROM COLCHESTER THROUGH ABBERTON, PELDON, AND STROOD GREEN TO MERSEA ISLAND, RETURNING THROUGH LANGENHOE, FINGRINGHOE, ROWHEDGE AND WIVENHOE TO COLCHESTER.

*Colchester.*—The first damage noticed was that two old chimney stacks in North-street, about 100 yards N. of the river Colne, were overthrown; in the town numerous chimney stacks were down, perhaps 5 per cent. of the whole, but they were mostly old or faulty. About 20 ft. of the top of the spire of the Congregational Church, in Lion Walk, was down, the piece destroyed being that which had been substituted for what had been brought down on a previous occasion by a gale; the débris fell partly through the roof and partly to N. 35° E. from the tower. Although considerable damage was done, no great force was probably required. The damage in *Colchester* itself seemed to be chiefly on the N.E. side of the town and along East Hill.

The son of Dr. Wallace (who resides in the centre of the town) was standing with his assistant facing S.W., when they considered

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that the shock came to them from S.W. and passed to E., and in support of this say that they saw chimney stacks fall to the S.W. of them, and felt the rocking of Dr. Wallace's house, before the spire of the chapel began to fall.

Starting on the road to *Abberton*, the damage in Head-street and the southern part of the town was found to be but slight. St. Giles's Rectory, about one mile S.S.E. of the town, was said to be much damaged.

Nothing of much importance, except a large chimney stack overthrown at *Roman Hill*, was observed until *Abberton* was reached, but there most of the tiled roofs had lost about half their tiles, apparently by a kind of quivering motion, and only a few chimney stacks were left standing. Near Borley's farm, almost the whole of a gable end, facing about S. by E., was thrown down. Between the village and the church is a nearly completed new rectory, very substantially built; none of the three chimney stacks has fallen, but two have their upper parts standing out of the square with their lower ones, indicating the twist which they have had. The architect states that there is scarcely a room in the house which has not sustained injury.

*Abberton Village.*—Not more than half-a-dozen chimney stacks remained standing, and those were all new and good. Most of the tiles had been shaken off the chancel roof of Abberton Church, a few off that of the nave, and the mullions of an old window had been shifted. Abberton Hall, a small house near the church, has lost part of one chimney stack. The very substantially built mansion known as Abberton House had been much shaken, and several of the chimney stacks were in process of removal. Of two old cottages running roughly N. and S., nearly all the tiles had slipped down, the chimney stacks were thrown over, the débris falling in the direction S.S.E. to N.N.W. (owner, working in garden, had to steady himself on his spade). A new and well-built cottage had its gable facing S. thrown out (about 20 feet of brickwork), the chimney stack at E. side fell over to E.N.E. The occupier saw stacks fall, first E. or E.N.E. of him, and afterwards others in S.W.

*Abberton* to *Peldon.*—Not a chimney stack standing along the road; two or three of the fallen ones appeared to have been very good work.

*Peldon.*—Probably 70 per cent. of all the chimney stacks gone, and several walls much shaken; brickwork as a rule good; S. end wall of cottage facing W. cracked from bottom to top; and the top of the gable fallen (good brickwork). Peldon Church had part of its battlements down, and its massive tower, of which the walls are nearly 2 ft. thick, cracked nearly from bottom to top, the crack at 5 ft. above the ground being nearly an inch wide; several large cracks along both sides of the nave and chancel, the portions of wall on different sides of some cracks being in different planes as much as half-an-inch to one inch. The glass from a standard lamp was

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thrown in a line E.S.E. to W.N.W. At Peldon Rectory, large, well-built stacks new, but with very heavy cornices, were thrown down, and a similar one was twisted two or three inches; a bronze statuette, weighing about 10 lbs., on a base five or six inches in diameter, and of which the centre of gravity was well within its base was thrown off the mantel-piece. There were cracks in various places, and not one upstairs room was habitable, owing to the roof being broken in by falling chimney-stacks.

In a row of three cottages, facing S.W., out of six chimney-stacks, only one was standing, viz., at the S.E. end, the N.W. stacks having in all cases suffered most; the N.W. end of each cottage had three or four large cracks twenty or thirty feet long, nearly or quite across it in a slanting direction, the top apparently having been thrust forward two or three inches, the S.E. ends appeared to be in their original positions; from the inside of the cottages daylight could be seen through the walls in many places.

Along the road towards Mersea the cottages were shaken, and stacks thrown down, but nothing very striking was seen for about a mile. The "*Rose*" *Inn* was much shaken; all the chimney-stacks were twisted or fell; two were twisted about four inches, the direction of revolution being from E. by N. to W.; the chimneys were supported by iron stays just below the point of rupture. Several of the walls were bulged, and the inside of one chimney was displaced right down to the fireplace. On the opposite side of the road, at *Peldon Mill* a chimney-stack or two had fallen, and a chimney-shaft, 30 ft. high, was broken across about 10 ft. from the top, and slightly twisted, the shaft was not old, remained upright, and appeared to be well and solidly built.

*Strood Villa*, the residence of Mr. Hugh Green, exhibited the worst specimen of damage. It appeared to be particularly well and substantially built, was of recent date (1860), and all built at one time; it had no tall or heavy chimney stacks and altogether appeared well calculated to escape damage by the shock. But yet it is in such a state that it is a marvel that it stands at all, every wall is cracked and twisted in a manner more suited to iron under the influence of sudden cold than to bricks and mortar; no junction of two walls is left undisturbed, scarcely a door frame is complete in its setting, and no room that is not damaged. The chimneys are of course gone, but there are also two unusual features; first that many panes of glass are broken—this (owing perhaps to the elasticity of glass) is very rare, even where thick walls are broken through. Secondly that about 80 feet of garden wall is down—this also is rare, the walls rarely swayed beyond the point at which the next vibration brought them back, standing, even if weakened.

The damage in *Mersea* proved to be less than was previously reported. Part of a mullion had been thrown W.S.W. from the belfry window of West Mersea Church, and two iron chimney pots fell away to the S.W. of the church, but that appeared to be all the

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injury there. At the National School, the bell and bell turret were thrown down. At the White Hart Inn, and at some of the cottages in *West Mersea*, chimneys had been overthrown, but nothing serious was observed.

The road from *West Mersea* to Mersea Lane forms the S.W. boundary of the island, and is 34 ft. above mean sea level, or perhaps 20 ft. above the saltings and muddy foreshore, to which it drops abruptly. Along perhaps 150 yards of this road, on the sea margin of it, *i.e.*, on the margin close to which the ground falls rapidly to the sea, a crack was formed, which in some places was said to have been about three inches wide, and more than two yards deep.

Near the church end of this lane, but on the shore, very little above high water mark, is a square wooden trough, constantly fed with good fresh water. This well formerly belonged to the Benedictine Priory, and is known as St. Peter's Well. During the shock the water was thrown out of the well, and that which refilled it was muddy, and it continued discoloured for about two hours.

Two seafaring men here stated that the shock appeared to travel from N.E., one describing how he saw women run screaming from houses to N. or N.E. of him at the instant that he first felt the shock.

Returning upon our previous path as far as the "Rose" at *Peldon*, we came to *Moor Farm*, where a piano standing on the S.E. side of a wall running S.S.W. to N.N.E. had remained steady at its N.N.E. end, but moved seven inches from the wall at the S.S.W. end. A table lamp fell towards E.S.E., and a small clock was thrown from the mantel-piece a distance of about 5 ft.

Between this and *Langenhoe* Church there are very few buildings, and the only damage observed was at *Peet Tye Hall*.

*Langenhoe.*—The church here suffered very severely; the battlements from the E. side of the tower fell through the roof of the church, and those from the W. side were thrown to the ground. The tower appeared much shaken; there were several large cracks in the walls of the church, and part of the end of the chancel was thrown outwards. Langenhoe Hall was shaken, and a chimney stack fell, but no especial damage was noted. Langenhoe Rectory is in a bad state; although not an old building, there are several cracks in the walls, and the chimney stacks were so shaken as to require immediate removal; the whole house appears to be considerably strained, and it is stated that scarcely any of the doors would open or shut. The rector states that the cracks in the gravel paths mentioned in the newspapers are due to the dry weather, and had appeared before the occurrence of the earthquake.

At *Fingringhoe*, there were several stacks damaged, and two much twisted; the church was a good deal cracked (but not so much as *Peldon* or *Langenhoe*), and there were one or two portions of masonry in a very unsafe condition. *Fingringhoe Hall & East Donyland Hall* were in process of repair.

At *Rowhedge*, probably half the chimney stacks were thrown down,

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and along the river front, perhaps 75 per cent., and one or two gables had been thrown down; there was a considerable variety of structure, but the new and good brickwork had suffered nearly as much as the old.

At *Wivenhoe*, the damage was widespread and resembled the effects of the Regent's Park explosion; the destruction was greatest in the lower part of the town fronting the river, and here 60 to 70 per cent. of the chimney stacks were thrown down. Several of the houses on the river side on what may be called the quay were, without exaggeration, wrecked; in one house the gable end facing S.W. was thrown out, but perhaps the worst case may be thus summarised. The floor was so heaved up as to render walking on it difficult in places; there were several cracks in the walls; a stack fell and destroyed a part of the back premises; a gable fell out to N.E., and part of the front wall facing S.W. was thrown down.

The battlements on the N. and W. sides of the church tower were thrown down, and a large crack extended from the top of the tower about half way down. The Independent Chapel, a very large one, had been surmounted by a balustrade and cornice; nearly the whole of it was thrown down.

At a small but substantial building belonging to Wivenhoe Hall, and just outside the village, an entire gable had fallen to N. (about 100 feet of brickwork); at Wivenhoe Hall, a well-built mansion, heavy chimneys fell in a N.E. direction, and the parapet showed a distinct crack on the N. aspect, but none on the S.; along the road towards Colchester fallen stacks were frequent, the proportion decreasing as Colchester was approached.

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We must, however, give details of what occurred in other places, and the most convenient mode of doing so will be to take the records arranged in counties, and in the sequence usual in our publications.

### MIDDLESEX.

The shock was felt in most parts of *London*, especially in the *Strand*, *Fleet Street*, the *City*, also in *Hampstead*, *Crouch End*, *Hornsey* and *Enfield*. Clocks were stopped in several localities, but all details respecting them will be transferred to the Essex Field Club.

### SURREY.

There are two records of its being felt near *Brixton*, and the photographic records of the magnets at *Kew Observatory*, show that they were shaken at 9.17 or 9.18 a.m. At *Frimley* tea was tipped out of the west side of a cup.

### KENT.

At *Rochester*, *Strood* and *Sheerness* the shock was violent, *e.g.*, at *Strood* the Board School was so shaken that the masters dismissed the scholars. At *Sheerness* and at *Herne Bay* house bells rang, and at

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*Greenwich Observatory* the photographic records of several of the instruments show vibration about 9.20 a.m. The shock was also felt at *Chiselhurst*, *Beckenham*, *Tunbridge Wells* and *Maidstone*, at the last town a long gas pendant was set swinging.

SUSSEX.

The shock was felt slightly at *Brighton*, at *Hastings* and at *St. Leonards*; at *Eastbourne* a ceiling was cracked.

HAMPSHIRE.

At *Freshwater* bed-hangings were set swinging, and at *Portsmouth* light articles of furniture were shaken.

BERKSHIRE.

Shock felt at *Reading*, and also in the village of *Sulhamstead*, six miles S.W. of *Reading*.

HERTFORDSHIRE.

*King's Langley.*—Light articles shaken, and curtains set swinging.
*Royston.*—Shock felt, but no damage done.

BUCKINGHAMSHIRE.

*Marlow.*—Bed rocked, and pictures swung about. Some persons in a boat in Temple Lock were much puzzled by the sensation, and thought they had run foul of something. The shock was also felt at *Taplow* and *Princes Risborough*, and very distinctly at *Wyfold Court* on the top of the *Chiltern Hills*.

OXFORDSHIRE.

At *Oxford* the vibration was very slight, and at *Tetsworth Castle*, *Watlington*, the shock was felt in several of the apartments.

NORTHAMPTONSHIRE.

The shock was felt in *Northampton*, and slightly in other parts of the county.

CAMBRIDGE.

In *Cambridge* the shock was felt, and the rumble of the explosion heard, doors were opened, and light articles shaken. It was felt at *Ely* and *Wisbeach* also.

ESSEX.

As this is the county in which almost all the structural damage occurred, it is necessary to take it in detail, and we therefore group the facts under the respective towns and villages, taking them in alphabetical order. The word "Report" against any place, implies that it was one of those our own report, which will be found on pages 51 to 55.

*Abberton.*—Report.

*Alresford.*—A large portion of the tiles have been shaken off the

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chancel of the church; several chimneys were overturned at the rectory, and chimneys also fell at the school, and at various houses in the parish.

*Ardleigh.*—The shock here felt much like that in a bad railway carriage running over an ill-made piece of line; the church bells rang, clocks were stopped, and several chimneys were broken.

*Berechurch.*—The fields were said to rise and fall like a wave, but no damage is reported.

*Birch.*—This seems just on the outskirts of the area of damage; a few chimneys were broken, and tiles loosened, but the restoration will only be a matter of a few pounds. A clock which had a heavy pendulum, but which was not going, was started.

*Bishop's Stortford.*—Considerable oscillation, furniture shaken, house bells rung, but no structural damage.

*Braintree.*—No structural damage, but a violent shock, several doors were thrown open, house bells rung, pendant gaseliers set swinging N.W. to S.E., and the safety valve of a boiler raised and steam allowed to blow off.

*Brightlingsea.*—Part of the top of the tower was shaken down and fell through the roof of the church, walls were cracked and chimneys overthrown in several parts of the town, but no serious damage occurred.

*Buckhurst Hill.*—Shock very slight, but a clock stopped proved the time to be between 9.18 and 9.18.30 a.m.

*Chelmsford.*—No structural damage, but the shock was rather severe, *e.g.*, a horse was thrown down, the signalman was thrown against the levers in his box, doors were set swinging, and many clocks were stopped.

*Clacton.*—Shock scarcely perceptible.

*Coggeshall.*—Several chimneys overthrown.

*Colchester.*—Report.

*Dedham.*—The church tower seen to oscillate, bells rung and chimneys overthrown at several houses.

*East Donyland.*—This parish has suffered severely—the gable top of the chancel of the church fell, the school and the rectory had chimneys damaged. Donyland Hall has its front cracked, all the chimneys but one overthrown, breaking up the roof, every room but one is damaged, and in one are four cracks, into each of which a hand could be put. Donyland Lodge was left in such a state that there was only one room in which a fire could be lighted.

*Earls Cone.*—Considerable vibration, but no structural damage.

*Feering.*—Roof of school slightly damaged, children much frightened, and one boy fainted.

*Fingringhoe.*—Report.

*Great Baddow.*—Strong shock, large yard clock stopped.

*Great Bentley.*—Shock severe, but no damage reported.

*Great Bromley.*—Two chimneys overthrown at the rectory.

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*Great Horksley.*—Strong vibration, house bells rung, but no structural damage.

*Great Wigborough.*—Church so damaged by falling of pinnacles, by shaking of tower, which now leans over the nave, that the architect advises entire rebuilding. Schools and many farm-houses damaged. A horse thrown down.

*Halstead.*—House bells rung, some glass overthrown and broken, but no serious damage.

*Harwich.*—One person thrown down, house bells rung, but no structural damage.

*Havering.*—This village being on a bed of clay 200 to 700 ft. thick, the shock was not felt, though it was at Romford, three miles off, on the gravel.

*Kelvedon.*—A lady thrown against a wall, a parrot shaken off its perch, the bells in most houses rang, but no structural damage.

*Langenhoe.*—Report.

*Layer Breton.*—Church damaged, but reports differ as to the amount of injury. Chimneys overthrown at the rectory, and some other houses.

*Layer de la Haye.*—The battlements of the church tower, and a quantity of the rubble coating, were dislodged and thrown into the graveyard, a portion of the apex of the south aisle was thrown off, and also the stone cross at the end of the nave. Many chimney stacks in the parish were either rent or thrown down.

*Layer Marney.*—Church tower shaken, but no serious damage.

*Lexden.*—Damage slight, being limited to a few displaced chimney pots and tiles.

*Little Waltham.*—Sharp shock, but no damage.

*Little Wigborough.*—The church damaged, parts of the masonry thrown down. The vicar says, "Church completely riddled, and must be rebuilt."

*Maldon.*—House bells were rung, doors opened and shut, and clocks stopped, but no structural damage.

*Manningtree.*—Several clocks stopped at the railway station, and the station-master thrown out of his chair, house bells rung, and crockery broken, but no structural damage.

*Mersea East.*—There is some difference in the reports as to the damage in this part of Mersea Island, but all statements agree that it was slight.

*Mersea West.*—Report.

*Messing.*—Large cracks in several parts of the church, and chimneys overthrown at some of the cottages.

*North Woolwich.*—Sharp shock but no structural damage.

*Old Heath.*—School slightly damaged; and also nearly every house in the parish; altogether in this little place there are 40 or 50 chimneys thrown down.

*Peldon.*—Report.

*Ramsey.*—Violent oscillation; the Vicar says, "I have experienced

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earthquakes in Malta often, but they were not more threatening than this one." No damage done.

*Romford.*—Houses shaken, and pictures set swinging.

*Roxwell.*—Bells rung, but no structural damage.

*Salcot.*—Church damaged.

*Southend.*—Sharp shock, bells rung, small articles thrown down, clock stopped, but no structural damage.

*Strood Green.*—Report.

*Thorpe le Soken.*—Sharp shock, but no structural damage.

*Walton on the Naze.*—Shock felt, but no damage.

*Wickham Bishop.*—Clock stopped, two chimneys thrown down, and one had to be taken down.

*Witham.*—Violent shock, nearly all the house bells rang, small articles thrown down, clocks stopped, but no structural damage.

*Wivenhoe.*—Report.

*Wix.*—Houses shaken, clocks stopped, but no structural damage.

SUFFOLK.

*Barham.*—Shock just sufficient to ring the house bells.

*Beccles.*—Shock felt.

*Boxford.*—Bells were rung, and several clocks stopped.

*Bury St. Edmunds.*—Slight shock, but some bells rang.

*Claydon.*—Shock began between 9.17.45 and 9.17.55. Windows rattled, and house bells rang.

*Framlingham.*—Slight shock, no damage.

*Haughley.*—Shock only slight, but some bells rang faintly; time between 9.17.50 and 9.18.10 a.m.

*Ipswich.*—Violent shock, small articles (*e.g.*, cups of coffee) thrown over, clocks stopped, a donkey thrown down, house bells rung, &c., but no structural damage.

*Henley Road, Ipswich.*—I presume few persons had the opportunity of observing the clouds on the morning of April 22nd, just previous to the shock of earthquake, which I had, so I venture to send you my observations made at the time.

I was lying in bed with my face towards a large window watching the clouds in the north-east part of the sky, and observed them thus for a quarter of an hour, measuring their movements by bars of the window panes, and had decided in my mind that the wind was in the S.E., from the direction the clouds went, hoping we should have it warmer, when all at once the clouds appeared to go and pass in every direction, and mix up together in a remarkable manner. This completely roused my attention, and I looked at a large chestnut tree in the park, saw all the leaves moving, saying to myself, "Whatever are you shuddering for; there is no wind." Only the leaves moved, not the tree, which stood on a side hill, facing the south.

Then came the awful rumbling sound under the bed, which heaved up. I started upright, saw the north wall of the room bend in and outward, and the pictures on that wall flapped. Those on the other walls only shook and moved, while everything in the room that could jingle did so. A clock on the

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north wall did not stop. I saw the small trees in rows from east to west, in the arboretum, shaking, not as if by wind, but as by a hand quickly shaking their stems. Also a tall plant in a pot in my room shook violently all over. The bells in the kitchen all jingled, and other things clattered, but no damage anywhere. My window looks towards the east, and the north wall is an outside wall. I made the observations, of the clouds, the leaves shaking, then the noise, all distinctly, though in quick succession, one after the other, but in how short a time I can't tell, but the clouds decidedly were the first to show any strange movement.—ELLEN BIDDELL.

*Layham.*—Strong shock, house bells rang, and clocks stopped.

*Nayland.*—A small cross thrown off the gable of the congregational chapel.

*Stowmarket.*—Sharp shock but no damage.

*Sudbury.*—Considerable vibration, a few bells rang, but no damage reported.

*Woodbridge.*—Shock slight, damage *nil.*

NORFOLK.

*Fakenham* and *Lynn.*—Shock felt, but no damage.

*Norwich.*—The hospital buildings all rocked about 9.18 a.m., apparently from S. to N.

*Yarmouth.*—Shock quite unmistakeable, some bells rang.

GLOUCESTERSHIRE.

*Bristol.*—Shock distinctly felt in the lower part of the city.

*Stroud.*—Shock sufficiently strong to set a card swinging.

WARWICKSHIRE.

*Birmingham.*—The vibration was felt in many places, and at the Central Restaurant, glasses were shaken off the shelves.

*Leamington.*—Shock distinctly felt, bed rocked, also a heavy Chinese table.

LEICESTERSHIRE.

*Ashby Parva.*—I was in bed (being an invalid), but writing at the time. My chronometer is temporarily out of gear. At 9.19 G.M.T. by my watch, and several clocks in the house (none of which can be trusted separately to a minute or two), I heard a roaring noise in the E., which made me look to a window facing E. by S. Almost simultaneously, heard a fall of soot and some pieces of mortar, and then became conscious that my bed was swaying, or being slightly tilted, apparently from S. to N. (or N. to S.) The shock I computed to last five seconds, and the oscillations—to which I paid careful attention, having had experience of earthquakes long ago—seemed about 2 per second; I lay perfectly still, instead of looking at the watch. Of those members of my household who were on the ground floor, none felt anything. Two servants, occupied in separate rooms on the same floor as I was on myself, heard the noise, and complained that they were seized with giddiness. The shock seemed to me to be marked by far less noise—I mean subterranean noise—but by what one would call "more swing and far less tremor,"

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that is, by oscillation of greater length than that of October, 1863, which I felt (much more violently than others in England) at Sellack, in Herefordshire, where some houses were injured on that occasion.—W. CLEMENT LEY.

*Husbands, Bosworth* and *Market Harborough.*—Sharp shock, but no damage.

*Leicester.*—Shock rather sharp, causing slight panic in one factory —no damage.

RUTLAND.

*Uppingham.*—Shock was felt all round here, but not in this town.

LINCOLNSHIRE.

*Long Sutton.*—Some men were at work upon the church steeple, when it rocked so much that, thinking it was going to fall, they descended.

*Boston.*—Severe oscillation at 9.20 a.m., but no damage; the shock was felt also at *Wainfleet, Skegness,* and *Spilsby.*

DERBYSHIRE.

*Derby.*—Sharp shock, shaking windows, &c., at 9.20 a.m.

*Brassington, Wirksworth.*—Bed shook as if a dog were under it.

CHESHIRE.

*Altrincham*—Shock distinctly felt.

FRANCE.

*Boulogne.*—Shock felt in several parts of the town at 9.30 a.m. Paris time ( = $9^{h}\cdot20^{m}\cdot39^{s}$ Greenwich time).

BELGIUM.

*Ostend.*—Room shook and bed oscillated two or three times from N.W. to S.E.

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We are extremely glad to state that the task of thoroughly discussing and reporting upon the mass of correspondence with which we have been favoured, of fully examining the damage done in Essex, and generally of preparing the report upon THE earthquake, has been undertaken by the Essex Field Club, a powerful local scientific society, in whose province the subject naturally falls.

Immediately upon receiving information that the Council of that Society was prepared to carry out the investigation thoroughly, we promised to transfer to it as soon as this article had been published, all the materials which we had been able to collect, and much of which it has been impossible to utilize here.

We have, however, given a selection of facts, and it only remains to concentrate in a few lines the conclusions which we think may be deduced from them, or perhaps we should say, from the whole of the data we have yet seen, both that printed and that which is going to the Essex Field Club :—

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1. The shock occurred between 9h. 17m. and 9h. 18m. a.m. on April 22nd, and there does not seem to be evidence of its reaching the most distant localities, *e.g.*, those 150 or 180 miles distant more than about two minutes later.

2. The shock was felt over an area about 250 miles from E. to W., and about 200 miles from N. to. S., *i.e.*, about 50,000 square miles. This area (*see general map*) should be studied in comparison with a map coloured geologically.

3. Structural damage is confined to Essex (except two or three insignificant trifles in the south of Suffolk), and the greatest intensity is limited to an area about 9 miles from E. to W., and about 5 miles from S. to N., *i.e.*, about 45 square miles, or less than one-thousandth of the area over which the shock was felt. *(See Special Map.)*

4. In the centre of this area there is one extending five miles westward from the meridian of 1° E., and from two miles to seven miles south of Colchester, within which area of 25 square miles there is hardly a house or a cottage that is not damaged. Fortunately, it is a thinly-peopled agricultural district; had it been otherwise, the wreck of buildings and the loss of life would have been fearful.

5. The statements as to the direction of the movement of the shock are extremely discordant; and some of the evidence afforded by cracked and overthrown buildings *seems* contradictory, but our present impression is that the shock was nearly vertical under the parish of Peldon, about six miles south of Colchester.

6. The shock was indisputably accompanied by sound.

7. We have no information as to the precise sum which would be required to reinstate all the public and private buildings, and the damaged contents of the latter, but we have ourselves seen dozens of cases which £100 would not cover, and several for which five times that sum would not suffice, but the majority of cottage cases would perhaps average £5 a-piece. Moreover, many of the inhabitants who were most shaken have been thoroughly unnerved.

8. Space and time alike preclude our giving the details of clocks stopped, but in the Metropolis there is no marked preponderance of evidence as to any direction. In Colchester, most of those stopped had their pendulums swinging E.–W. In the district of maximum disturbance, nearly all were stopped, irrespective of their position.

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## JANUARY, 1884, IN THE UNITED STATES.

(*Continued from page 36.*)

"The minimum temperatures in Montana, Dakota, and Minnesota on the 4th, and during the 5th and 6th, over the central valleys and Southern States, were generally the lowest recorded since the establishment of the Signal Service Stations. Over north-eastern Montana and the northern parts of Dakota and Minnesota the minimum temperatures were—40° and below on the morning of the 4th. Very low temperatures also occurred on the 24th, 25th and 26th in the lake region, where, at the most northerly stations, they were lower than those on the previous dates.

### DAKOTA.

"*Huron.*—On the 3rd the maximum temperature was —4°·4; minimum, —22°·5. On the 4th, the temperature fell to —38°, which is said to be the lowest ever recorded. On that date the temperature did not rise above —26°. A minimum temperature of —38° was also recorded on the 5th.

"*Bismarck.*—The 4th was the coldest day experienced for many years; mean temperature for the day, —34°·3; minimum, —40°."

### ILLINOIS.

"*Rockford, Winnebago County.*—The temperature on the 4th, —40°, is the lowest known for forty years."

"*Peoria, Peoria County.*—The temperature on the 5th fell to —27°, the lowest recorded during the last 29 years."

"*Edgington, Rock Island County.*—The weather on the 3rd, 4th and 5th was the coldest experienced since 1856. The thermometer indicated —34° on the morning of the 5th. Many persons were frost-bitten."

"*Riley, McHenry County.*—The minimum temperature, — 30°·5, on the morning of the 5th, was the lowest that has occurred during the last twenty-one years. The mean for that date, —23°, is, with the exception of that for January 1, 1864, the lowest daily mean recorded during the last twenty-one years."

"*Collinsville, Madison County.*—The minimum temperature of the 5th, —23°, was the lowest recorded since January 1, 1864."

### INDIANA.

"*New Albany, Floyd County.*—The 5th was the coldest day that has been experienced for thirty-five years. At 6 a.m. the temperature was —23°; at noon, —10°; and at 7 p.m., —12°."

"*Sunman, Ripley County.*—On the morning of the 5th the thermometer indicated a temperature of —24°, which is the lowest recorded for the last thirty years."

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### IOWA.

"*Council Bluffs, Pottawattomie County.*—At 10 p.m. of the 4th the thermometer read —24°, the lowest observed for twenty-five years."

### MINNESOTA.

"*Mineapolis.*—The thermometer at noon of the 4th read —30°, the lowest temperature experienced for twenty-five years."

### MISSOURI.

"*Pierce City.*—The temperature at 7 a.m. of the 5th was —22°; at 2 p.m., —4°; 9 p.m., —9°; daily mean —11°·6. Mr. J. J. Spilman states that that was the coldest day that has occurred since 1847."

"Professor Francis E. Nipher, Director of the Missouri Weather Service, reports:—'The lowest temperature recorded in *Saint Louis* was —23°·4, which is half a degree colder than the previously observed minimum in January, 1873. In the State the temperature has fallen still lower. The lowest minimum reported was —33° at *Sedalia*, *Warrenburg* and *Kirksville* reporting—32°; *Boonville* and *Harrisonville*, —31°; *Miami*, —30°; and *Savannah*, —27°. The highest minimum temperatures reported were —16° at *Cairo, Illinois*, —23°·5 at *Saint Louis*, and —24°·2 at *Keokuk, Iowa*."

"The following notes on the low temperature of the 5th are given by the observers:—*Saint Charles*, the 5th was the coldest ever observed here; *Oregon*, coldest since January 18th, 1857, when the thermometer registered —30°; *Ironton*, coldest weather yet observed here, thermometer read —23°; the coldest heretofore was —17°."

### OHIO.

"*Findlay, Hancock County.*—The thermometer read —20° on the 5th, which is the lowest observed since 1855, when it read —22°."

"The following record furnished by Mr. G. W. Harper, of *Mount Auburn, Cincinnati*, shows the lowest temperatures since 1856:—1856, January, —14°; 1857, January, —13°; 1879, January 3rd, —16°; 1880, Nov. 19th, —12°; 1884, January 5th, —20°."

"*North Lewisburg, Champaign County.*—The temperature of the 25th, —23°·5, was the lowest experienced for 50 years."

### WISCONSIN.

"*Sussex, Waukesha County.*—The 4th was the coldest day that has occurred during the last 20 years, the daily mean temperature being —24°·5."

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## EDITORIAL.

BELIEVING that it was desirable to give the whole article upon the earthquake of April 22nd in one month, we have been obliged not only to increase the number of pages, but also to hold over nearly all the articles on general meteorology.

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# SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ·90 | XI. | Carno, Tybrith ... ..... | 1·49 |
| ,, | Margate, Birchington... | 1·50 | ,, | Corwen, Rhug ..... | 1·93 |
| ,, | Littlehampton ..... | 1·50 | ,, | Port Madoc ..... | 1·32 |
| ,, | Hailsham ..... | 1·71 | ,, | I. of Man, Douglas ..... | ... |
| ,, | I. of W., St. Lawrence. | 1·16 | XII. | Stoneykirk, Ardwell Ho. | ... |
| ,, | Alton, Ashdell..... | 1·65 | ,, | Melrose, Abbey Gate ... | 1·55 |
| III. | Winslow, Addington ... | 1·16 | XIII. | N. Esk Res. [Penicuick] | 1·10 |
| ,, | Oxford, Magdalen Col... | 1·69 | XIV. | Ayr, Cassillis House ... | 1·19 |
| ,, | Northampton ..... | 1·52 | ,, | Glasgow, Queen's Park. | ·72 |
| ,, | Cambridge, Beech Ho... | 1·17 | XV. | Islay, Gruinart School.. | 1·61 |
| IV. | Southend ..... | 1·00 | XVI. | St. Andrews, Newton Bk | 1·32 |
| ,, | Harlow, Sheering ... .. | 1·16 | ,, | Balquhidder, Stronvar.. | 2·30 |
| ,, | Diss ..... | 1·46 | ,, | Dunkeld, Inver Braan.. | 1·20 |
| ,, | Swaffham ..... | 1·16 | ,, | Dalnaspidal H.R.S. ... | 2·44 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | ·95 |
| V. | Salisbury, Alderbury... | 1·73 | ,, | Forres H.R.S. ..... ... | ·49 |
| ,, | Warminster ..... | 2·16 | XVIII. | Strome Ferry H.R.S.... | 2·46 |
| ,, | Calne, Compton Bassett | 1·82 | ,, | Lochbroom ..... | ·92 |
| ,, | Ashburton, Holne Vic.. | 3·28 | ,, | Tain, Springfield..... | ·47 |
| ,, | Holsworthy, Clawton... | 1·97 | ,, | Loch Shiel, Glenaladale | 1·93 |
| ,, | Lynmouth, Glenthorne. | 1·60 | ,, | Invergarry ..... | 1·83 |
| ,, | Probus, Lamellyn ..... | 1·94 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Wincanton, Stowell Rec. | 2·74 | ,, | Forsinard H.R.S. ..... | ·68 |
| ,, | Taunton, Fullands ..... | 1·46 | ,, | Watten H.R.S. ..... | ·53 |
| VI. | Bristol, Clifton ..... .. | 1·12 | XX. | Dunmanway, Coolkelure | 2·44 |
| ,, | Ross ..... | 1·43 | ,, | Fermoy, Gas Works ... | 1·40 |
| ,, | Wem, Sansaw Hall..... | 1·16 | ,, | Tralee, Castlemorris ... | 1·89 |
| ,, | Cheadle, The Heath Ho. | 1·64 | ,, | Tipperary, Henry Street | 1·42 |
| ,, | Worcester, Diglis Lock | 1·34 | ,, | Newcastle West ..... | 1·39 |
| ,, | Coventry, Coundon ..... | 1·94 | ,, | Miltown Malbay..... | 1·56 |
| VII. | Melton, Coston ..... | 1·54 | ,, | Corofin ..... | 1·07 |
| ,, | Ketton Hall [Stamford] | 1·37 | XXI. | Carlow, Browne's Hill.. | 1·24 |
| ,, | Horncastle, Bucknall ... | ·90 | ,, | Navan, Balrath ..... | 1·39 |
| ,, | Mansfield, St. John's St. | 2·06 | ,, | Mullingar, Belvedere... | 1·32 |
| VIII. | Macclesfield, The Park. | 1·24 | ,, | Athlone, Twyford ..... | 1·53 |
| ,, | Walton-on-the-Hill..... | 1·16 | XXII. | Galway, Queen's Col.... | 1·31 |
| ,, | Lancaster, South Road. | 1·17 | ,, | Clifden, Kylemore ..... | ... |
| ,, | Broughton-in-Furness .. | ... | ,, | Crossmolina, Enniscoe.. | 1·28 |
| IX. | Wakefield, Stanley Vic. | 1·46 | ,, | Carrick-on-Shannon ... | ·76 |
| ,, | Ripon, Mickley ..... | 2·25 | XXIII. | Dowra ..... | .. |
| ,, | Scarborough..... | 1·83 | ,, | Rockcorry..... | 1·44 |
| ,, | East Layton [Darlington] | 1·84 | ,, | Warrenpoint ..... | ... |
| ,, | Middleton, Mickleton .. | 2·36 | ,, | Newtownards ..... | 1·00 |
| X. | Haltwhistle, Unthank.. | 1·52 | ,, | Belfast, New Barnsley . | 1·34 |
| ,, | Shap, Copy Hill ..... | 2·01 | ,, | Cushendun ..... | 1·00 |
| XI, | Llanfrechfa Grange ..... | 1·22 | ,, | Bushmills ..... ..... | 1·49 |
| ,, | Llandovery ..... | 2·32 | ,, | Stewartstown ..... | 1·71 |
| ,, | Solva ..... | 1·75 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 2·09 | ,, | Buncrana ..... | 1·53 |
| ,, | Rhayader, Nantgwillt.. | 2·44 | ,, | Carndonagh ..... | 1·88 |

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# APRIL, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. Nights below 32 In shade | In sun |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·02 | — 1·00 | ·36 | 6 | 14 | 68·4 | 2 | 29·9 | 23*h* | 4 | |
| II. | | Maidstone (Hunton Court)... | 1·17 | — ·68 | ·47 | 27 | 15 | ... | ... | ... | ... | ... | |
| „ | | Strathfield Turgiss ..... | 1·64 | — ·27 | ·55 | 6 | 11 | 65·9 | 2 | 22·9 | 23 | 11 | |
| III. | | Hitchin ..... | 1·33 | — ·62 | ·37 | 6 | 13 | 63·0 | 2 | 22·0 | 18*i* | 11 | |
| „ | | Banbury ..... | 1·78 | — ·23 | ·47 | 6 | 14 | 64·0 | 3 | 24·5 | 23 | 8 | |
| IV. | | Bury St. Edmunds (Culford) | ·96 | — ·83 | ·25 | 6 | 16 | 66·0 | 2 | 21·0 | 23 | 13 | |
| „ | | Norwich (Cossey) ..... | 1·99 | + ·13 | ·50 | 6 | 19 | 68·5 | 2 | 28·5 | 20*j* | 6 | |
| V. | | Weymouth (Langton Herring) | 2·36 | .... | ·56 | 1 | 12 | ... | ... | ... | ... | ... | |
| „ | | Barnstaple ..... | 1·55 | — ·83 | ·31 | 2 | 11 | 63·0 | 9*b* | 37·0 | 27*k* | 0 | |
| „ | | Bodmin ..... | 2·22 | — 1·11 | 1·12 | 4 | 8 | 57·0 | 6 | 31·0 | 24 | 1 | |
| VI. | | Cirencester ..... | 1·85 | — ·55 | ·51 | 1 | 11 | .. | ... | ... | ... | ... | |
| „ | | Church Stretton (Woolstaston) | 1·84 | — ·48 | ·90 | 3 | 13 | 61·0 | 3 | 30·0 | 18*l* | 7 | |
| „ | | Tenbury (Orleton) ..... | 1·59 | — ·58 | ·27 | 5 | 15 | 63·2 | 8 | 25·2 | 23 | 7 | |
| VII. | | Leicester ..... | 1·77 | ... | ·32 | 6 | 20 | 67·5 | 3 | 26·2 | 23 | 3 | |
| „ | | Boston ..... | 1·20 | — ·69 | ·35 | 12 | 18 | 67·0 | 2 | 30·0 | 24 | 2 | |
| „ | | Grimsby (Killingholme)..... | 1·55 | — ·21 | ·21 | 12 | 21 | 64·0 | 2 | 31·0 | 24 | 1 | |
| „ | | Hesley Hall [Tickhill]..... | 1·34 | ... | ·21 | 11 | 17 | 67·0 | 3 | 22·0 | 24 | 7 | |
| VIII. | | Manchester (Ardwick)..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| IX. | | Wetherby (Ribston Hall) ... | 1·69 | — ·82 | ·59 | 2 | 10 | ... | ... | ... | ... | ... | |
| „ | | Skipton (Arncliffe) ..... | 2·76 | — ·30 | ·52 | 1 | 18 | 68·0 | 2 | 27·0 | 23 | 6 | |
| X. | | North Shields ..... | 2·16 | + ·16 | ·28 | 1 | 23 | 61·0 | 4 | 29·2 | 26 | 4 | |
| „ | | Borrowdale (Seathwaite)..... | 4·15 | — ·79 | 1·10 | 5 | 19 | 63·2 | 3 | 28·5 | 25 | ... | |
| XI. | WALES. | Cardiff (Ely)..... | 1·58 | — ·76 | ·45 | 3 | 11 | ... | ... | ... | ... | ... | |
| „ | | Haverfordwest ..... | 2·47 | — ·35 | ·64 | 1 | 11 | 58·0 | 10 | 27·1 | 22 | 7 | |
| „ | | Plinlimmon (Cwmsymlog) ... | 1·54 | ... | ·39 | 3 | 9 | ... | ... | ... | ... | ... | |
| „ | | Llandudno..... | 1·19 | — ·69 | ·42 | 3 | 11 | 57·0 | 5*c* | 31·2 | 18 | 1 | |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 1·21 | — 1·08 | ·28 | 2 | 11 | 59·8 | 9 | 30·0 | 25 | 4 | |
| „ | | Hawick ..... ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| XIV. | | Douglas Castle (Newmains) | ·88 | — 1·00 | ·35 | 3 | 7 | ... | ... | ... | ... | ... | |
| XV. | | Lochgilphead (Kilmory)..... | 1·30 | — 1·33 | ·46 | 30 | 11 | 62·0 | 10*d* | 29·0 | 13*m* | 8 | |
| „ | | Oban (Craigvarren) ..... | 1·54 | ... | ·59 | 30 | 12 | 60·5 | 3 | 35·0 | 1, 12 | 0 | |
| „ | | Mull (Quinish)..... | 2·03 | ... | ·92 | 30 | 14 | ... | ... | ... | ... | ... | |
| XVI. | | Loch Leven Sluices ..... | 1·10 | — 1·11 | ·20 | 1*a* | 8 | ... | ... | ... | ... | ... | |
| „ | | Arbroath ..... | 1·49 | — ·42 | ·41 | 2 | 12 | 53·0 | 4*e* | 32·0 | 10*n* | 2 | |
| XVII. | | Braemar ..... | 2·45 | + ·37 | 1·13 | 5 | 18 | 59·2 | 3 | 24·8 | 10 | 12 | |
| „ | | Aberdeen ..... | 1·49 | ... | ·38 | 1 | 23 | 56·0 | 3*c* | 29·0 | 27 | 4 | |
| XVIII | | Skye (Sligachan) ..... | 4·27 | ... | 2·77 | 31 | 8 | ... | ... | ... | ... | ... | |
| „ | | Culloden ..... | ·51 | — ·84 | ... | ... | ... | 58·0 | 4 | 31·0 | 21 | 2 | |
| XIX. | | Dunrobin ..... | ·44 | ... | ... | ... | ... | 56·0 | 3 | 30·0 | 1 | 2 | |
| „ | | Orkney (Sandwick)..... | ·76 | — 1·11 | ·23 | 30 | 15 | 54·8 | 3 | 33·3 | 28 | 0 | |
| XX. | IRELAND. | Cork (Blackrock)..... | 1·93 | — 1·17 | ·64 | 4 | 15 | 71·0 | 13 | 32·0 | 19 | 1 | |
| „ | | Dromore Castle ..... | 2·46 | ... | ·56 | 1 | 14 | 60·0 | 26 | 32·0 | 18*o* | 3 | |
| „ | | Waterford (Brook Lodge) ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| „ | | Killaloe ..... | 2·08 | ... | ·62 | 25 | 10 | 63·0 | 29 | 29·0 | 24 | 7 | |
| XXI. | | Portarlington ..... | 1·20 | — ·83 | ·44 | 4 | 12 | 60·0 | 9 | 29·5 | 17 | 5 | |
| „ | | Dublin (Fitz William Square) | 1·53 | — ·58 | ·86 | 4 | 11 | 59·3 | 7 | 33·9 | 1 | 0 | |
| XXII. | | Ballinasloe ..... ..... | 1·01 | — 1·25 | ·45 | 4 | 12 | 57·0 | 10*f* | 29·0 | 24 | 5 | |
| XXIII | | Waringstown ..... | 2·30 | + ·41 | ·62 | 3 | 11 | 66·0 | 9 | 29·0 | 24 | 6 | |
| „ | | Londonderry (Creggan Res.). | 1·60 | ... | ·50 | 3 | 14 | ... | ... | ... | ... | ... | |
| „ | | Omagh (Edenfel) ..... | 1·29 | — ·71 | ·29 | 3 | 13 | 57·0 | 6*g* | 32·0 | 7*p* | 4 | |

+ Shows that the fall was above the average; — that it was below it.

*a* And 3, 23. *b* And 18, 25. *c* And 8. *d* And 12. *e* And 6, 30. *f* And 29. *g* And 9, 10, 11. *h* And 24. *i* And 22. *j* And 23, 24, 26. *k* And 28. *l* And 22, 23. *m* And 28. *n* And 27. *o* And 21, 22. *p* And 10, 19, 28.

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# METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—During the early part of the month growth was suspended in the vegetable world by the cold N.E. winds; beyond this the cold did no harm; the wheat plant on poor clays looked yellow, but on the whole the check was salutary. Swallow first seen on 1st, marten on 10th; cuckoo first heard on 12th, nightingale on 14th.

BANBURY.—Mean temp. 44°·3, 1°·5 below the average; high wind on 16th and 17th, L on 2nd, distant T on 8th, H on 13th, 18th, and 30th.

CULFORD.—A most variable month, commencing with quite summer weather, and ending with sharp frosts: most disastrous to the fruit crop.

COSSEY.—The prevalence of E. wind made this an ungenial month, and the growing corn was injured by the sharp frosts; swallows seen on 11th.

WOOLSTASTON.—A cold month, with harsh E. winds and frosty nights, checking all vegetation; mean temp. 43°·9. A terrific storm of H with T, and vivid L occurred on 3rd; the hailstones were fully as large as hazel nuts, some of them remaining unmelted till the following morning; much damage was done by the H, which lasted about 10 minutes, and a house was struck by the L; a similar storm, but of much less violence occurred on the 23th; cuckoo not heard till 24th.

ORLETON.—Considerable quantities of R fell daily during the first week, with distant TSS on 2nd and 3rd, and the temp. till the 10th was above the average; on the 9th the wind changed to the N.E., where it remained persistently strong and cold till the end of the month with a low temp., and a sky generally clouded; severe frosts occurred on several mornings. The mean temp. of the month was 3°·5 below the average of 23 years; the latter portion of the month favourable for the cultivation of the land. Swallows first seen on 7th; cuckoo heard generally on 20th; the smaller summer birds did not appear till the end of the month; damson trees were in blossom about the 6th, and cherry trees about the 15th.

LEICESTER.—The month commenced mild and damp, but in the second week became dry and cold, N. and N.E. winds prevailing to the end; warm genial weather was much needed at the close of the month.

BOSTON.—Frosts on the 23rd and 24th did very serious injury to the fruit crops.

GRIMSBY, KILLINGHOLME.—The polar current prevailed through the month, giving dry cold weather, unfavourable for fields and gardens; it gave way at the close, when a welcome change took place. The frosts seriously injured much of the fruit blossom.

HESLEY HALL [TICKHILL].—A cold month, very trying to weak persons, and doing much damage to the fruit blossoms; milder weather set in at the close. T on night of 2nd.

## WALES.

HAVERFORDWEST.—The month commenced stormy, wet and cold, after which a dry period set in, with bright sunshine frequently, and harsh, dry N. and N.E. breezes, the result being that all the grass and keep for cattle throughout the country seemed to disappear as by magic; the effects on the human constitution were also disastrous. White frosts prevailed throughout the month, and the mean temp. was below the average; the blackthorn blossomed in profusion.

LLANDUDNO.—A fine spring month on the whole, though perhaps too dry, there being scarcely any R between the 6th and 27th. Although the mean temp. was nearly 3° below the average, there was only one night of frost, and

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the range both diurnal and monthly was considerably less than the average. E. winds prevailed during a great part of the month, though their keenness was somewhat tempered by the large amount of sunshine.

## SCOTLAND.

CARGEN.—Cold easterly winds prevailed during the greater part of the month; mean temp. 1°·7 below the average; duration of sunshine 50 hours less than the average; T and L on 3rd and 5th, T on 2nd.

ORAN, CRAIGVARREN.—A very fair month, and warm for the season, with unusually dry weather, but a low bar. After almost uninterrupted drought for 21 days, a change set in on the evening of the 29th, with heavy R and H and S on the hills; crops were very backward, owing to the drought.

MULL, QUINISH.—A dry and sunny, but rather cold month, very favourable for spring cultivation; wind from E. to N. until 28th.

BRAEMAR.—The weather was favourable, but very cold E. winds prevailed throughout; the high hills were entirely covered with fresh S, and several severe frosts occurred during the latter part of the month.

ABERDEEN.—With the exception of the first three days, when the rainfall was heavy, the weather throughout the month was showery, with a prevalence of S.E. winds; the total rainfall, however, was nearly an inch below the average. Aurora seen on two nights.

SLIGACHAN.—A fine dry month; the first ten days warm and genial; from 10th to 20th the weather was very dry, with cold hard E. winds, which checked all vegetation; the latter part of the month was more genial. The night of the 30th was very stormy with R, H, T and L, and a great many lambs perished.

CULLODEN.—The month generally was dry, and R was wanted at the close; vegetation late, and making little progress, but not injured by frost.

SANDWICK.—April was free from such gales as occurred in the previous month, and was very dry; but the prevailing E. and S.E. winds, coupled with the drought during the latter part, gave a severe check to vegetation. Aurora on 11th and 24th.

## IRELAND.

BLACKROCK.—The month generally was favourable for farming operations; dry E., N.E. and S.E. winds prevailed in the middle and latter part of the month, with some sunshine. Vegetation backward.

DROMORE CASTLE.—The beginning of the month was mild, but towards the middle cold hard E. winds set in, checking vegetation; but it made rapid progress during the last six or eight days.

KILLALOE.—Rainfall below the average; sharp E. and N.E. winds prevailed from the 5th to the end of the month, with bright clear weather.

DUBLIN.—A cold, dry month, the wind blowing almost constantly from easterly points of the compass was of a particularly dry and searching character. Mean temp. 1°·7 below the average of 20 years. Sleet and S on 1st, L on 4th, fog on 8th, 9th, 11th and 24th.

BALLINASLOE.—The month generally was fine, but with very cold, harsh winds, retarding vegetation.

EDENFEL.—The month was a dry and favourable, though somewhat ungenial seed-time; vegetation backward.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXI.] JUNE, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## EASTER AT THE SORBONNE.

THE gatherings at Paris this year have been overshadowed by a loss which is one not merely to France but to Science. Though M. Dumas had passed beyond the allotted fourscore years, his mind was still clear; it is but a short time since he delivered an address lasting an hour without a single written note, and his presence and Presidency of the Congress of Electricians had been looked forward to with great interest.

The very morning fixed for the opening of the Sorbonne Réunion had to be appropriated to the obsequies of the great chemist, and it is not often that such a gathering of French savans is possible as was formed round his bier in the Church of Ste. Clothilde.

An attempt was made this year to systematize the communications, and a programme of special subjects for discussion had been prepared and printed. Although we heard little or nothing of the programme, it was by no means a bad one, and may be useful elsewhere or at another time, so we give it here.

*Section for the Mathematical, Physical, Chemical and Meteorological Sciences.*

1. Studies of the mistral.
2. Observations on earthquakes by registering instruments.
3. Heat lightning: frequency of storms in a single day.
4. Study of phenological phenomena.
5. Of what use, as regards weather forecasting, would be the data furnished by electrical and magnetical observations?
6. Researches on the presence of watery vapour in the atmosphere, made by actinometers and spectroscopes.
7. Comparison of the climates of the south, and of the south-west of France.

In proof of our statement that the programme produced no effect, we subjoin the list of the only papers upon meteorology announced for reading:—



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1. M. COULON.—*On a new pluviograph and actinograph.*
2. M. LANGLOIS.—*On a hygrometer giving directly the tension of vapour in the atmosphere.*
3. M. MAC CARTHY.—*On the distribution of rainfall over Algeria.*
4. DR. ROUYER.—*Clouds on the earth's surface.*

Of these only two of the authors attended the meetings, and therefore papers Nos. 3 and 4 were not read. Owing to papers running short on the Thursday afternoon, two extempore communications were made—one by M. Angot and one by M. Renou, of each of which we give a report.

M. RAIMOND COULON.—*Description of a new pluviograph and actinograph.*—M. Coulon began his paper by referring to a popular idea that there is some sort of connection between the tides of the ocean (or at any rate between them when they enter rivers) and the weather experienced on the shores of those rivers. In order to test this, he had designed two instruments, neither aiming at precision, but each intended to give a general notion of the state of the weather. The former was composed of a wheel with buckets at the end of its spokes, and a water pipe from any roof was led over the buckets; therefore, whenever rain was running off the roof, the wheel would turn. Upon the wheel is a stud which, at each revolution, strikes a spring, and thereby completes an electric circuit and draws a pencil about a quarter of an inch along a paper-covered cylinder, which is, by a clock, rotated once in 24 hours; if the rain is very heavy, the lines are too close together to be counted, and as the fall decreases they separate, and thus the amount of shading is roughly proportional to the heaviness of the fall. Thus far the result is not very different from that given by the pattern designed by Dr. Fines, of Perpignan, many years ago. But here we come upon a novelty which may be useful in other cases, and which, therefore, we describe fully.

The paper-covered cylinder is, as we have said, rotated once in 24 hours, but we have also stated that the trace occupies about a quarter of an inch. The paper is, however, about 2½ inches broad, and therefore there is room for 10 traces, each clear of the other; and as the cylinder can be clamped upon its axle in any position, it is merely necessary each day to slide the cylinder a quarter of an inch forward, and thereby ensure that the record shall fall clear of the previous one. Few arrangements could be more handy than this for showing the prevalence, or absence, of periodicity in any phenomenon; for one at once has on a single narrow strip the records of the same instants of civil time precisely under one another. (And the three strips for the 30 days of a month are, when mounted together, not taller than this page). And as regards tidal phenomena, lunar positions, &c., it is merely necessary to plot on the sheets the time of their occurrence each day, and to join them by a strongly marked line, in order to see if any relation exists between the indications of the pluviograph and the phenomena under examination.

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M. Coulon, considering that there may be cloudiness and *almost* rain without any indication being given by his pluviograph, has designed an actinograph, which seems to us a more useful instrument than the now fashionable sunshine recorder. The actinograph has several points in common with the pluviograph, the clockwork sliding cylinder, and the dimensions thereof being similar; it is very small, all being contained in an iron box (with ground glass front) about 10 in. by 6 in. by 5 in. The author considered that the choice of a photographic paper should be based upon the facility with which the fixing could be effected by persons not acquainted with photographic manipulation, nor provided with complete apparatus. He had therefore chosen a ferro-prussiate paper, which, while sufficiently sensitive, required for its fixing nothing more elaborate than dipping in a basin of warm water. The author did not appear to have decided whether the window of his actinograph was to be kept turned towards the position of the sun or not—obviously to do so it must be put upon an equatorial mounting with a driving clock. M. Faye, who was presiding, suggested the simpler and more desirable plan of merely exposing the plate to light coming direct from the zenith.

M. LANGLOIS.—*On a hygrometer giving directly the tension of vapour in the atmosphere.*—This was a notice of two arrangements for determining the decrease in the volume of confined atmosphere consequent upon the extraction of its vapour by contact with concentrated sulphuric acid. It was pointed out by M. Angot that this method is by no means new, and that far better and more accurate forms have been invented and described—*e.g.*, Schwackhöfer's and Dines's.

M. LÉON VIDAL.—*On a pocket photographic apparatus.*—This, though not a meteorological paper, claims notice here as a very useful equipment for the inspectors of meteorological stations. M. Vidal produced from his pockets the whole of the apparatus except the tripod stand, which goes in a bamboo scarcely thicker than an ordinary walking stick. M. Vidal claims for the apparatus that it is of far better quality than any of the many small ones yet brought out, and is lighter and more portable than any of them. The dry plates used are $2\frac{1}{4}$ inches by $2\frac{1}{2}$, but the lenses are so good that the photographs will bear considerable enlargement. It is obvious that if this or some similar apparatus of extreme simplicity and portability can be brought out at a moderate price, there should be a considerable demand for it by geologists and physical geographers. Take for instance the sites of some of our rain gauges, and think how much light would be thrown on discordant records by a series of four or six views of the country in different directions as viewed from the gauge. We have in our mind one instance in which the shape of some hills raises the mean annual rainfall, at absolutely the same elevation, from 66 to 100.

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At the request of M. Faye,

M. RENOU, gave a brief abstract of his recent investigation into *The relation of the amount of cloud to that of the daily oscillation of the barometer*.—M. Renou began by stating that inasmuch as the hour of both the morning maximum and the afternoon minimum of atmospheric pressure varied with the seasons, the true amplitude was not that between the mean for any two constant hours, but between the hours of highest and lowest mean for each month, assuming, of course, that hourly values alone were being dealt with. He said that at the observatory at Parc St. Maur, in the suburbs of Paris, the mean time of the morning maximum was 8 a.m. in the summer and nearly 11 a.m. in the winter, and the time of afternoon minimum about 5 p.m. in summer, and between 2 and 3 p.m. in winter. M. Renou stated that the amount of the daily oscillation rose from a minimum in November to a maximum in April, and that the curve of the amount of cloud ran almost parallel with it, but in the reverse direction, the decrease of cloud agreeing with increase of barometric range. But there was one remarkable fact, namely that the cloud curve was a month later than the range curve, so that the minimum of cloud fell in May and the maximum in December. M. Renou said that it was very important to make such comparisons for long periods, but at present there were few stations for which hourly records of the amount of cloud as well as of barometric pressure had been published.

M. ANGOT, being also called upon by M. Faye, gave a brief abstract of the report of phenological phenomena in France, which is about to appear in one of the volumes of the *Bureau Central Météorologique*. In a country like France embracing not only a considerable area, but also land differing greatly in altitude, and with about 1500 observers, it soon became evident that curves representing phenological records would really be almost orographical ones. M. Angot therefore found himself confronted by the necessity of determining the nature and amount of correction required by stations at heights of 300 feet and upwards.

As regards plants he found that each 82 ft. of additional altitude above sea level caused a lateness of one day in the leafing, flowering, &c., and M. Angot exhibited to the meeting two maps, one in which the observations were entered as recorded, the other in which they had been corrected for the altitude of the various stations. The necessity for applying some correction of this kind is indisputable, the only uncertainty is as to its amount, and M. Angot's maps seem to show that he has reached it very nearly. Possibly it will eventually be found that the correction varies, according to the inclination of the ground, *e.g.*, that stations open to the south require corrections of 150 ft. for each day, and those on northern slopes of 50 ft. for each day. Soil also will probably have its effect, but these re minor details to be worked out subsequently.

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As regards the arrival and departure of migratory birds, M. Angot finds a correction to be also necessary, but not so large a one as for plants. Birds seem to arrive one day later for each 164 ft., and to depart one day earlier for each 328 ft.

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## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, April 16th, at the Institution of Civil Engineers, 25, Great George Street, Mr. J. K. Laughton, M.A., F.R.A S., Vice-President, in the chair; Messrs. J. Y. Davidson and T. Wright were elected Fellows of the Society.

The following papers were read:—

(1.) "On the origin and course of the Squall which capsized H.M.S. *Eurydice*, March 24th, 1878," by the Hon. Ralph Abercromby, F.R. Met. Soc. It will be remembered that the *Eurydice*, which was a full-rigged corvette, when passing Ventnor, in the Isle of Wight, running free before a westerly wind, with all sails set, was struck by a sudden squall from the north-west; and before sail could be shortened, she went on her beam ends, and the lee ports being open, she filled and foundered. The author has investigated the character of the weather preceding and following the day in question, and finds that the squall was one belonging to the class which is associated with the trough of V-shaped depressions. This squall, which originated in the north of England, swept across the Isle of Wight at a rate of about 38 miles an hour. The V-depression was of an uncommon class, in which the rain occurs after the passage of the trough, and not in front of it, as is usually the case. The weather generally for March 24th was unusually complex, and of exceptional intensity, and for this reason some of the details of the changes cannot be explained. [For another paper on this subject with two maps see *Met. Mag.*, Vol. XIII., p. 33. ED.]

(2.) "Waterspouts and their formation," by Captain J. W. C. Martyr.

(3.) "The Weather Forecasts for October, November and December, 1883," by C. E. Peek, M.A., F.R. Met. Soc. This is a comparison of the weather indicated in the Forecasts of the Meteorological Office with that actually experienced at Rousdon, in Dorset.

(4.) "On certain effects which may have been produced in the atmosphere by floating particles of volcanic matter from the eruptions of Krakatoa and of Mount St. Augustin," by W. F. Stanley, F.R. Met. Soc. The author having obtained specimens of volcanic dust from Krakatoa, which was collected on board some vessels in the neighbourhood of the eruption, and having examined them under the microscope, is of opinion that such dust, suspended in the atmosphere, was quite capable of producing the recent remarkable sunrises and sunsets and other effects.

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At the meeting on May 21st, Mr. R. H. Scott, F.R.S., President, in the chair, Captain W. W. Hampton and C. D. F. Phillips, M.D., F.R.C.S., F.R.S.E., were elected Fellows of the Society.

The following papers were read :—

(1.) "Notes on the Proceedings of the International Polar Conference, held at Vienna, April 17th to 24th, 1884," by R. H. Scott, F.R.S., President. This Conference was held to welcome the several expeditions on their return from the Arctic regions, and to discuss the best mode of utilizing their labours.

(2.) "Meteorological Observations on the Maloja Plateau, Upper Engadine, 6,000 feet above the Sea," by Dr. A. T. Wise, F.R. Met. Soc. The Maloja Plateau is situated at the higher extremity of the Upper Engadine, and is protected from northerly, easterly and southerly winds. The author gives some account of the meteorology of this plateau, and also the observations made during the four months, November, 1883, to February, 1884.

(3.) "On some Results of an examination of the barometric variations in Western India," by A. N. Pearson, F.R. Met. Soc.

(4.) "Illustrations of the mode of taking meteorological averages by the method of weighing paper diagrams," by R. Inwards, F.R. Met. Soc., F.R.A.S.

(5.) "Ten Years' Weather in the Midlands," by Rupert T. Smith, F.R. Met. Soc.

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## VISITATION DAY AT GREENWICH.

EVERYBODY does not know what the above implies, we therefore preface our usual extract from the Astronomer Royal's report, with a brief explanation, the absolute accuracy of which we do not guarantee, but which is as nearly correct as we can make it.

The Royal Observatory was founded in 1675, *i.e.*, in the reign of Charles II., expressly with the object of facilitating the discovery of the longitude at sea, hence naturally the observatory is regarded and charged as a branch of the Admiralty.

On the first Saturday in June of each year, there is a meeting held at the Observatory of a sort of council, called the Board of Visitors, to whom the Astronomer Royal submits a report on the work done during the previous year, and any important proposals which he desires to bring before the Admiralty. This Board of Visitors is almost as venerable an institution as the Observatory itself, for it was in existence in 1748, and how long before that date we are not aware. The Board consists chiefly of *ex-officio* members, *e.g.*, President Royal Society, President Royal Astronomical Society, Hydrographer to the Admiralty, Directors of the Observatories at Cambridge and at Oxford, &c. But besides the actual members of the Board, many leading astronomers and some meteorologists are invited to inspect the observatory, every part of which is on that day thrown open to them. This gathering is that known as visitation day.

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The following are the principal paragraphs in the report which deal with meteorology:—

"The meteorological instruments and the Thomson electrometer have been maintained in good order. In the gale of Jan. 23 [1884] the short connecting chain attached to the pressure plate of Osler's anemometer gave way, having perished in course of many years' exposure to the weather. After some delay through our having to wait for a quiet day before the pressure plate could be examined, a new chain was substituted on Feb. 26. The flexible brass chain connecting the external chain with the recording pencil continues to give very satisfactory results.

"A new photographic thermometer apparatus, in which I have arranged that the dry and wet bulb traces shall fall on the same part of the photographic cylinder as regards time-scale, is being made by Messrs. Negretti and Zambra, and, after many delays, is now nearly finished. By means of a long air bubble in the wet-bulb thermometer, with a column of mercury above, the degrees and decades of degrees are registered for this thermometer, just below the trace of the dry-bulb thermometer, and without any interference of the two records. The scale of time for the thermometers will in this arrangement be the same as for all the other registers, both magnetical and meteorological.

"A slight shift has been made in the positions of the rain gauges in the Magnetic ground.

"The observations of the temperature of the Thames made at the Deptford Cattle Market are regularly communicated to the Royal Observatory, and appear to be quite satisfactory."

"The mean temperature of the year 1883 was 49°·3, being 0°·4 lower than the average. The highest air temperature was 85°·1 on August 21, and the lowest 20°·6 on March 24. The mean monthly temperature was above the average in January and February, and below in March and July. In the other months it differed little from the average.

"The mean daily motion of the air in 1883 was 291 miles, being 12 miles greater than the average. The greatest daily motion was 842 miles on December 12, and the least 62 miles on December 26. The pressures exceeding 20 lbs. in 1883 were 28·0 lbs. on January 27, 28·5 lbs. on February 2, 24·4 lbs. on March 6th, 20·5 lbs. on October 17, and 26·5 lbs. on December 12.

"During the year 1883 Osler's anemometer showed an excess of 16 revolutions of the vane in the positive direction N, E, S, W, N, if all the turnings are counted; or of 19 revolutions in the positive direction if the turnings which are evidently accidental are excluded.

"The number of hours of bright sunshine recorded by Campbell's sunshine instrument during 1883 was 1241, which is about 30 hours above the average of the six preceding years. The aggregate number of hours during which the Sun was above the horizon was 4454, so that the mean proportion of sunshine for the year was 0·280 constant sunshine being represented by 1.

"The rainfall in 1883 was 21·9 inches, being about 3 inches below the average.

"Tracings of the barometer registers for the days following the Krakatoa eruption have been sent to Mr. R. H. Scott and to M. Paul Schreiber. Two series of atmospheric disturbances recurring at intervals of about 36 hours are recorded from August 27 to September 1.

"We remarked no definite connexion between magnetic or electrical disturbances and the phenomena of the remarkable sunsets of the past winter."

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## A HEAVY INDIAN RAINFALL AND ITS RESULT.

WE have been favoured by Mr. W. M. Beaufort with the report recently adopted by the Great Indian Peninsular Railway Company containing the following details of the rainfall of July 1st and 2nd, 1883:—

"I must, however, refer to the serious interruption of traffic during the half-year on the North-East extension, through damage to the line between 284 and 298 miles, and two large bridges, each of seven 30 feet girder openings at the *Ajunta* and *Bookree* rivers at mileages 295¾ and 298 being destroyed by heavy floods on the night of 1st and 2nd July, regarding which I have already fully reported. Through traffic could not be restored over these rivers before the 2nd August, but the line, where damaged, was quickly repaired, and traffic resumed working to each side of the rivers on the 7th July.

"From the commencement I had determined to erect a temporary wooden bridge of full width of river, and to same level as the old bridge over the *Ajunta*, and this was immediately put in hand, and successfully carried through, without cessation, to completion. At the *Bookree*, recognising the greater difficulties of erecting quickly a similar bridge there, I decided to put in a diversion of the line, and a temporary bridge on a low level, which would, in all ordinary cases, have been sufficient, but on the night of the 14th July, a second flood swept along the river, and carried away all the work done in the channel of the river. It was then apparent that nothing short of a work of a much more substantial character would be required, and this was at once commenced, and traffic worked over it on the 2nd August.

"The rainfall which gave rise to the flood on the night of July 1st and 2nd, was confined to the south of the *Sautpura* range, and the wind and rain seem to have been of a cyclonic character, and in fact the meteorological records showed that a cyclone was travelling across the country from the central provinces towards *Indore*. The register of rainfall at *Bhosawul*, gives the very high record for the plains of India of 18·25 inches in 24 hours, of which 15·15 inches fell between 6 p.m. of the 1st, and 6 a.m. of the 2nd July, a rainfall which I believe to be without precedent; whereas at *Khundwa* the quantity of rain which was registered for the same time measured only 1·82 inches.

"The rivers *Taptee* and *Waghur* on either side of *Bhosawul* and the *Sookee Nullah*, which the line of railway crosses, and their tributaries were also in great flood, and between *Bhadli* and *Bhosawul* the way and works were considerably damaged by the heavy rain.

"I am happy to say that the vigilance of the permanent way inspectors, their platelaying muccadums and patrolmen, on the night of July 1st, effectually secured the safety of the traffic, and there is no casualty to trains or loss of life to record."—WILSON BELL, C.E.

By the courtesy of the Managing Director of the Company we have obtained some further particulars, which, with our own comments, may be epitomized as follows:—The site of the accident is about 290 miles N.E. of Bombay (about Longitude 76° E., and Latitude 21° N.), between the Sautpoor (or Satpura) mountains, and the river Tapty (or Taptee). The rivers mentioned by Mr. Bell are not marked on all maps, but are northern tributaries of the Tapty. A rainfall of 15 inches in twelve hours in the wet districts of India

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would scarcely claim notice in these pages, but Ravere is in a dry district, the mean rainfall being, according to Mr. C. Chambers' *Meteorology of the Bombay Presidency*, scarcely 20 inches.

Moreover, it appears improbable that the fall can be explained away by the rather old hypothesis of a waterspout, for though a waterspout might easily have produced the 18·25 inches recorded at Bhosawul it would go but a little way towards filling and flooding two Indian rivers. Possibly Mr. Chambers may favour us with some notes upon the subject.

## THE MILDNESS OF THE WINTER 1883-4.

For the following remarkable particulars as to the temperature of the past quarter at Greenwich, as prepared by Mr. Glaisher, F.R.S., we are indebted to the Quarterly Return of the Registrar General:

*January.*—The mean temperature of January was 43°·9, being 7°·4 and 5°·3 above the averages of 113 years and 43 years respectively. Back to 1771 there have been only two instances of a mean temperature for January being as warm as 43°·9, viz.:—

1796 ..... 45°·3 1834 ..... 44°·4

*February.*—The mean temperature of February was 41°·9, being 3°·2 and 2°·4 above the averages of 113 years and 43 years respectively. Back to 1771 there have been twenty-four previous instances of a mean temperature as high as 41°·9, viz.:—

| | | | | | |
|---|---|---|---|---|---|
| 1775 ..... | 41°·9 | 1846 ..... | 43°·9 | 1867 ..... | 44°·7 |
| 1779 ..... | 45·3 | 1848 ..... | 43·4 | 1868 ..... | 43·0 |
| 1794 ..... | 44·7 | 1849 ..... | 43·2 | 1869 ..... | 45·3 |
| 1809 ..... | 44·1 | 1850 ..... | 44·7 | 1871 ..... | 42·4 |
| 1817 ..... | 42·6 | 1856 ..... | 42·0 | 1872 ..... | 44·8 |
| 1822 ..... | 43·3 | 1859 ..... | 43·1 | 1877 ..... | 43·5 |
| 1826 ..... | 42·2 | 1861 ..... | 42·1 | 1878 ..... | 42·2 |
| 1833 ..... | 42·4 | 1863 ..... | 42·1 | 1883 ..... | 42·6 |

*March.*—The mean temperature of March was 44°·5, being 3°·4 and 2°·8 above the averages of 113 years and 43 years respectively. Back to 1771 there have been eleven previous instances, viz.:—

| | | | | | |
|---|---|---|---|---|---|
| 1777 ..... | 44°·6 | 1822 ..... | 47°·3 | 1871 ..... | 44°·9 |
| 1779 ..... | 47·0 | 1830 ..... | 45·8 | 1872 ..... | 44·6 |
| 1780 ..... | 49·2 | 1841 ..... | 46·2 | 1882 ..... | 46·0 |
| 1815 ..... | 45·6 | 1842 ..... | 44·9 | | |

*January to March.*—The mean temperature for the quarter ending March was 43°·4, being 4°·7 and 3°·5 above the averages of 113 years and 43 years respectively, there have been only three instances of a mean temperature of a quarter as high as this, viz.:—

1822 ..... 43°·5 1846 ..... 43°·6 1872 ..... 43°·6

*October to March.*—The mean temperature of the six months from October, 1883, to March, 1884, was 44°·2, being 3° above the average of 113 years, there being only six instances of a temperature as warm or warmer, viz.:—

| | | | | | |
|---|---|---|---|---|---|
| 1819 ..... | 44°·3 | 1834 ..... | 44°·2 | 1849 ..... | 44°·2 |
| 1822 ..... | 45°·5 | 1846 ..... | 44°·7 | 1877 ..... | 44°·6 |

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCT., 1883.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 64·6 | 15 | 36·9 | 22 | 57·7 | 45·0 | 45·9 | 86 | 103·6 | 28·4 | 1·75 | 14 | 5·9 |
| Malta | 81·8 | 1 | 54·8 | 27 | 73·0 | 62·8 | 58·9 | 76 | 138·2 | ... | 2·67 | 12 | 3·4 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 80·3 | 24 | 62·0 | 8 | 76·9 | 66·2 | 61·2 | 72 | ... | ... | 1·89 | 13 | 5·9 |
| Calcutta | 92·4 | 6 | 65·2 | 26 | 87·8 | 73·9 | 73·2 | 80 | 156·4 | 55·6 | ·75 | 3 | 3·1 |
| Bombay | 90·4 | 12 | 72·8 | 30 | 86·0 | 75·6 | 74·4 | 81 | 148·6 | 60·4 | 10·40 | 12 | 4·1 |
| Ceylon, Colombo | 87·7 | 3 | 71·8 | 15 | 85·5 | 75·4 | 71·5 | 74 | 147·0 | 68·5 | 14·05 | 21 | 8·4 |
| *Melbourne* | 86·2 | 20 | 41·7 | 6 | 66·7 | 47·9 | 45·7 | 69 | 143·1 | 32·0 | 2·79 | 19 | 6·3 |
| *Adelaide* | 87·3 | 23 | 40·5 | 27 | 69·2 | 50·1 | 45·7 | 59 | 145·0 | 36·2 | 1·79 | 15 | 5·4 |
| *Wellington* | 70·0 | 5 | 35·0 | 1 | 59·7 | 45·5 | ... | ... | 128·0 | 33·0 | 4·73 | 14 | ... |
| *Auckland* | 66·5 | 26* | 42·0 | 14 | 61·4 | 50·5 | 47·1 | 73 | 139·0 | 38·5 | 4·16 | 22 | 7·9 |
| *Falkland Isles* | 61·4 | 9 | 28·3 | 3 | 51·2 | 35·9 | 38·5 | 76 | 121·7 | 22·2 | ·55 | 9 | 6·1 |
| Jamaica | 90·3 | 4 | 70·8 | 8 | 87·7 | 72·9 | 72·9 | 84 | ... | 65·1 | 4·46 | ... | 7·1 |
| Barbados | 84·0 | 21 | 69·0 | 17 | 81·0 | 73·0 | 73·6 | 87 | 145·0 | 62·0 | 14·72 | 21 | 6·0 |
| Toronto | 71·0 | 10 | 27·1 | 27 | 52·1 | 37·6 | 39·8 | 77 | 128·0 | 21·5 | ·96 | 14 | 6·7 |
| New Brunswick, Fredericton | 72·8 | 10† | 16·9 | 23 | 52·1 | 30·9 | 34·2 | 76 | ... | ... | 4·06 | 12 | 5·1 |
| Manitoba, St. Andrews | 66·3 | 7 | 14·7 | 20 | 45·9 | 26·8 | 32·3 | 86 | ... | ... | 2·54 | 11 | 6·8 |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 29. † And 14.

### REMARKS, OCTOBER, 1883.

MALTA.—Mean temp. 67°·0; mean pressure 30·065 in.; average velocity of wind 8·4 miles per hour; temp. of sea ranged from 74° to 70°, the mean being 72°; L on 7 days, T on 5. J. SCOLES.

*Mauritius.*—Rainfall ·56in. above the average; mean temp. 0°·5 below it; mean pressure 30·139 in.; mean hourly velocity of wind 11·1 miles, extremes 25°·8 miles and 1·6 miles, prevailing direction E.S.E. Unusually prolonged and intense colorations of the sky before sunrise and after sunset every day, lasting 1h. 15m. C. MELDRUM, F.R.S.

*Melbourne.*—Mean temp. of air and of dew point below the average; mean pressure, amount of cloud, humidity and rainfall all very near the average; prevailing direction of wind S.W. and W.; strong breezes on 7 days; heavy dew on 7 days; T and L on 3 days. Zodiacal light very bright throughout, and beautiful glows of light visible in the western sky, by many mistaken for the auroral light. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure 30·064, slightly above the average; mean temp. 59°·6, 2°·5 below the average; the month was unusually cold, in fact, with one exception, the coldest since 1857; the mean diurnal range 19°·1 is also very small; rainfall just the average; amount of cloud ·6 above it. On every clear evening during this month, and the last fortnight of September, a peculiar phenomenon has been apparent in the western sky. Shortly after sunset, a red glow will make its appearance at an altitude of about 50°, being very faint at first; but as the brightness of the sky near the horizon dies away with the receding sun, the red glow will expand downwards, becoming at the same time more brilliant, until at last the whole western sky will be lit up with a beautiful light, varying in colour, from a delicate pink to a most intense scarlet, and the spectacle presents a most brilliant appearance. The upper

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part will then gradually fade away, until the colour is noticeable only 7° or 8° above the horizon, at which time the light is at its brightest. Afterwards a secondary glow will sometimes make its appearance, at an altitude of about 50°, and gradually spread downwards until the sky is again lit up. In the secondary phenomenon, the colours are generally more delicate. The whole thing will fade away about 8 p.m. This phenomenon has been noticed all over the south eastern portion of this continent, from Pt. Augusta (lat. 32° S.) to Melbourne; and in India, the sun has at times presented a most peculiar appearance, being green at rising, then gradually changing to a blue at noon, and inversely from noon to sunset. Various theories have been started to account for the phenomena.

*Wellington.*—Fine, with northerly winds up to the 9th. on which night it changed to S.E. with heavy R, and continued showery and squally up to 23rd; N.W. gale, 16th, 17th, and 18th; very wet on 19th, with strong wind at night; from 24th to 29th, fine; on 29th, stormy from N.W., with heavy R at night; remainder of month fine; mean pressure above, and mean temp. below the average. R. B. Gore.

*Auckland.*—Showery and variable weather throughout; mean pressure above, and mean temp. considerably below the average; rainfall much in excess.
T. F. Cheeseman.

*Falkland Isles.*—A very dry month; rainfall 1·20 in. below the average of 7 years.
F. E. Cobb.

Barbados.—Mean temp. 76°·5, 0°·5 below the average; N.E. winds on 30 days; average velocity 7·3 miles per hour, extremes 13·4 miles and 2·8 miles; rainfall 36 per cent. above the average; evaporation the same as the average; 11 days were overcast; TSS on 15th and 17th. R. Bowie Walcott.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1883.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 55·8 | 28 | 28·7 | 13 | 49·9 | 37·2 | 39·4 | 92 | 77·3 | 20·3 | 2·78 | 16 | 6·7 |
| Malta | 73·1 | 8 | 51·2 | 27 | 67·5 | 57·1 | 53·6 | 77 | 128·2 | ... | 6·24 | 11 | 4·4 |
| *Cape of Good Hope* | .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Calcutta | 87·1 | 13 | 51·1 | 22 | 81·2 | 61·0 | 59·5 | 71 | 150·3 | 38·0 | ·00 | 0 | 1·8 |
| Bombay | 89·3 | 5 | 66·1 | 26† | 85·6 | 71·8 | 67·7 | 70 | 145·8 | 53·6 | ·86 | 1 | ·9 |
| Ceylon, Colombo | 86·7 | 16 | 71·3 | 21 | 84·1 | 73·3 | 70·5 | 76 | 146·0 | 67·0 | 9·12 | 18 | 8·4 |
| *Melbourne* | 93·0 | 23 | 38·1 | 2 | 73·0 | 51·9 | 49·6 | 67 | 156·1 | 29·1 | 3·22 | 12 | 6·5 |
| *Adelaide* | 99·0 | 23 | 45·6 | 15 | 77·7 | 56·6 | 49·0 | 52 | 159·9 | 39·6 | 1·83 | 15 | 4·8 |
| *Wellington* | 71·0 | 14 | 40·3 | 5 | 61·5 | 48·3 | ... | ... | 140·0 | 35·0 | 3·40 | 16 | ... |
| *Auckland* | 74·0 | 28 | 45·5 | 6 | 65·8 | 51·7 | 48·0 | 69 | 147·0 | 39·0 | 3·49 | 18 | 7·0 |
| *Falkland Isles* | 62·8 | 4 | 31·2 | 8 | 5·17 | 38·0 | 39·9 | 75 | 121·7 | 24·2 | 2·07 | 21 | 6·2 |
| Jamaica, Kingston | 88·8 | 6* | 65·0 | 26 | 86·0 | 70·3 | 70·5 | 83 | ... | 59·0 | 3·67 | ... | 4·4 |
| Barbados | 83·0 | 1,7 | 70·0 | 24 | 80·0 | 72·0 | 73·6 | 89 | 146·0 | 71·0 | 7·34 | 19 | 6·0 |
| Toronto | 60·1 | 22 | 13·4 | 16 | 44·6 | 29·7 | 32·9 | 77 | 97·0 | 5·0 | 2·47 | 17 | 7·1 |
| New Brunswick, Fredericton | 62·7 | 6 | 3·5 | 17 | 42·0 | 23·2 | 28·9 | 81 | ... | ... | 2·83 | 12 | 6·0 |
| Manitoba, Winnipeg | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 10, 11. † And 30.

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### Remarks, November, 1883.

Malta.—Mean temp. 61°·2; mean hourly velocity of wind 9·4 miles; mean temp. of sea 68°·0; TS8 on four days, and L on two other days. J. Scoles.

Colombo.—TS8 occurred on three days, and L was seen on five other days. J. H. Symonds.

*Melbourne.*—Mean temp. of air and of dew point, both about one degree above the average; pressure and humidity average; rainfall ·81 in. and amount of cloud 0·5 above the average; prevailing direction of wind S. and S.W., strong breezes occurring on four days, L on five days, T on three days, H on one day, Aurora Australis on 22nd. R. L. J. Ellery, F.R.S.

*Adelaide.*—Mean pressure about the average; mean temp. (67°·2) 0°·8 above the average, the max reached 90°·0 on five days. The state of the atmosphere was very peculiar and unseasonable from 20th to 25th (inclusive) there was a TS or L every day and the weather throughout the period was unseasonably sultry and oppressive. The rainfall of the month was nearly double the average of 26 years, and the total for the 11 months of this year is the greatest (except 1875) during that period being 6½ inches in excess of the average. The peculiar red glow described in last month's remarks was very bright at the commencement of the month, but towards the end it had become fainter, and the zodiacal light which had not been noticed at the beginning began to be visible, being rather bright at times. C. Todd.

*Wellington.*—The weather was unsettled till the 5th, on which day 1·10 in. of R fell, it was then fine with moderate wind, chiefly southerly, till 12th; the 13th was very oppressive, with severe T and heavy R, and the weather continued showery and unsettled, and at times squally, till 25th; the remainder of the month was fine. Mean temp. 2° below the average; rainfall nearly one inch below it. R. B. Gore.

*Auckland.*—The weather was variable and unsettled during the whole month; mean temp. and pressure both below the average; rainfall in excess, but no heavy fall in one day. T. F. Cheeseman.

Barbados.—Mean pressure about the average; mean temp. (75°·8) 0°·7 below the average of 25 years; average velocity of wind 9·1 miles per hour, extremes 18 miles and 1 mile; rainfall 10 per cent. below the average; evaporation 18 per cent. above the average; 7 days were overcast. R. Bowie Walcott.

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## CUTTINGS.

A Cloud of Carbon.—The black cloud, which recently passed over a part of Lancashire, and darkened certain neighbourhoods for about an hour, appears to have been caused by an accumulation of finely-divided carbon. The Rev. S. J. Perry, Stonyhurst Observatory, writes:—"At 11.30 the darkness was so great that it was found impossible to read even bold print (small pica) close by the window, and at this time a dense black cloud, with a slightly yellowish tinge, hung over the south-west sky; the blackness being most intense at 10° above the horizon. At 11.35 it became somewhat lighter, and 11.40 the rain began to fall, and in forty minutes 0·114 inch of rain-water was collected in our rain-gauges, the whole being almost as black as ink, and full of fine carbon in suspension. Hail that fell a mile off to the south-west by south, and snow that fell on the hills two miles to the west, were also black."—*Public Opinion.*

The Climate of Manitoba.—A correspondent says:—"As to the climate, it is far more enjoyable than Ontario; the winter, although cold, is not unpleasant; we were able to work out nearly every day with very little inconvenience; the depth of snow never exceeded twelve inches at any one time, and the roads consequently were excellent for sleighing; we had no rainfall the whole winter, so that stacks were left open without any fear of injury. The summer is all that could be desired; perhaps I should draw attention to the fact that there is a very heavy dew each night, which appears to be sufficient to ensure a luxuriant growth of all kinds of vegetation, and there is also a very large proportion of sunshine, which is another important element in farming.—*The Colonies.*

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# SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ·35 | XI. | Carno, Tybrith ..... | 2·74 |
| ,, | Margate, Birchington... | ·20 | ,, | Corwen, Rhug ..... | ... |
| ,, | Littlehampton ..... | ·43 | ,, | Port Madoc ..... | 3·62 |
| ,, | Hailsham ..... | ·48 | ,, | I. of Man, Douglas ..... | 1·26 |
| ,, | I. of W., St. Lawrence. | 1·15 | XII. | Stoneykirk, Ardwell Ho. | 2·05 |
| ,, | Alton, Ashdell..... | ·76 | ,, | Melrose, Abbey Gate... | 2·00 |
| III. | Winslow, Addington ... | ·95 | XIII. | N. Esk Res. [Penicuick] | 4·15 |
| ,, | Oxford, Magdalen Col... | ·80 | XIV. | Ayr, Cassillis House ... | 3·80 |
| ,, | Northampton ..... | ·90 | ,, | Glasgow, Queen's Park. | 2·92 |
| ,, | Cambridge, Beech Ho... | ·81 | XV. | Islay, Gruinart School.. | 2·47 |
| IV. | Southend ..... | ·27 | XVI. | St. Andrews, Newton Bk | 1·87 |
| ,, | Harlow, Sheering ..... | ·52 | ,, | Balquhidder, Stronvar.. | 6·85 |
| ,, | Diss ..... | 1·20 | ,, | Dunkeld, Inver Braan.. | 2·89 |
| ,, | Swaffham ..... | ·76 | ,, | Dalnaspidal H.R.S. ... | 4·39 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 1·72 |
| V. | Salisbury, Alderbury... | ·89 | ,, | Forres H.R.S. ..... ... | 1·11 |
| ,, | Warminster ..... | 1·53 | XVIII. | Strome Ferry H.R.S.... | 4·34 |
| ,, | Calne, Compton Bassett | 1·59 | ,, | Lochbroom ..... | 4·30 |
| ,, | Ashburton, Holne Vic.. | 2·64 | ,, | Tain, Springfield..... | 2·03 |
| ,, | Holsworthy, Clawton... | 1·16 | ,, | Loch Shiel, Glenaladale | 8·67 |
| ,, | Lynmouth, Glenthorne. | 2·13 | ,, | Invergarry ..... | 4·64 |
| ,, | Probus, Lamellyn ..... | 1·08 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Wincanton, Stowell Rec. | 1·62 | ,, | Forsinard H.R.S. ..... | 2·86 |
| ,, | Taunton, Fullands ..... | ·94 | ,, | Watten H.R.S. ..... | 2·25 |
| VI. | Bristol, Clifton ..... .. | 2·50 | XX. | Dunmanway, Coolkelure | 4·63 |
| ,, | Ross ..... | ·57 | ,, | Fermoy, Gas Works ... | 1·10 |
| ,, | Wem, Sansaw Hall..... | ... | ,, | Tralee, Castlemorris ... | 2·62 |
| ,, | Cheadle, The Heath Ho. | 1·41 | ,, | Tipperary, Henry Street | 2·08 |
| ,, | Worcester, Diglis Lock | 1·25 | ,, | Newcastle West ..... | 2·14 |
| ,, | Coventry, Coundon ..... | 1·14 | ,, | Miltown Malbay..... | 4·02 |
| VII. | Melton, Coston ..... | 1·20 | ,, | Corofin ..... | 2·19 |
| ,, | Ketton Hall [Stamford] | 1·28 | XXI. | Carlow, Browne's Hill.. | 1·52 |
| ,, | Horncastle, Bucknall ... | 1·04 | ,, | Navan, Balrath ..... | 1·73 |
| ,, | Mansfield, St. John's St. | ·80 | ,, | Mullingar, Belvedere ... | 2·97 |
| VIII. | Macclesfield, The Park. | 2·23 | ,, | Athlone, Twyford ..... | 3·95 |
| ,, | Walton-on-the-Hill..... | 1·27 | XXII. | Galway, Queen's Col.... | 4·29 |
| ,, | Lancaster, South Road. | 2·65 | ,, | Clifden, Kylemore ..... | ... |
| ,, | Broughton-in-Furness .. | 4·08 | ,, | Crossmolina, Enniscoe.. | 3·14 |
| IX. | Wakefield, Stanley Vic. | ·99 | ,, | Carrick-on-Shannon ... | 2·74 |
| ,, | Ripon, Mickley ..... | ·91 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | ... | ,, | Rockcorry..... | 2·73 |
| ,, | East Layton [Darlington] | ·60 | ,, | Warrenpoint ..... | 2·30 |
| ,, | Middleton, Mickleton.. | 1·43 | ,, | Newtownards ..... | 2·33 |
| X. | Haltwhistle, Unthank.. | 3·43 | ,, | Belfast, New Barnsley.. | 3·52 |
| ,, | Shap, Copy Hill ..... | 4·22 | ,, | Cushendun ..... | 3·27 |
| XI. | Llanfrechfa Grange ..... | 1·95 | ,, | Bushmills ..... ..... | 2·45 |
| ,, | Llandovery ..... | 2·82 | ,, | Stewartstown ..... | 3·08 |
| ,, | Solva ..... | ... | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 1·69 | ,, | Buncrana ..... | 2·88 |
| ,, | Rhayader, Nantgwillt.. | 3·12 | ,, | Carndonagh ..... | 3·12 |

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# MAY, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | ·78 | — 1·14 | ·15 | 12 | 11 | 81·3 | 24 | 35·0 | 1 | 0 | 1 |
| II. | | Maidstone (Hunton Court)... | ·30 | — 1·72 | ·08 | 3 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | ·67 | — 1·01 | ·16 | 5 | 8 | 82·5 | 24 | 32·4 | 1 | 0 | 4 |
| III. | | Hitchin ..... ..... | ·55 | — 1·44 | ·21 | 2 | 9 | 74·0 | 24 | 33·0 | 6 | 0 | ... |
| ,, | | Banbury ..... | 1·24 | — ·89 | ·28 | 12 | 10 | 76·5 | 12 | 33·0 | 1 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·03 | — ·87 | ·33 | 2 | 10 | 79·0 | 10*a* | 31·0 | 6 | 2 | ... |
| ,, | | Norwich (Cossey) ..... | ·86 | — ·95 | ·33 | 2 | 7 | 78·0 | 11 | 33·0 | 7 | 0 | 4 |
| V. | | Weymouth(LangtonHerring) | ·77 | ... | ·20 | 19 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 1·31 | — ·79 | ·45 | 2 | 10 | 81·0 | 25 | 37·5 | 1 | 0 | ... |
| ,, | | Bodmin ..... | 1·26 | — 1·58 | ·27 | 7 | 11 | 73·0 | 24 | 38·0 | 1 | 0 | 6 |
| VI. | | Cirencester ..... | ·78 | — 1·40 | ·16 | 4 | 9 | .. | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 1·34 | — 1·05 | ·43 | 2 | 12 | 75·0 | 23 | 35·0 | 7 | 0 | 2 |
| ,, | | Tenbury (Orleton) ..... | ·71 | — 1·72 | ·23 | 2 | 10 | 78·5 | 11 | 36·5 | 21 | 2 | 7 |
| VII. | | Leicester ..... | 1·10 | ... | ·38 | 2 | 12 | 80·0 | 23 | 34·9 | 5 | 0 | 11 |
| ,, | | Boston ..... | 1·11 | — ·66 | ·40 | ·2 | 8 | 80·0 | 12 | 35·0 | 1 | 0 | ... |
| ,, | | Grimsby (Killingholme)..... | ·81 | — ·84 | ·24 | 5 | 12 | 69·0 | 22 | 36·0 | 1,7 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·79 | ... | ·12 | 19 | 11 | 83·0 | 11 | 34·0 | 7*c* | 0 | ... |
| VIII. | | Manchester (Ardwick)..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| IX. | | Wetherby (Ribston Hall) ... | ·71 | — 1·11 | ·32 | 4 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 4·53 | + 1·41 | 1·15 | 15 | 15 | 76·0 | 11 | 33·0 | 18*c* | 0 | ... |
| X. | | North Shields ..... | ·58 | — 1·27 | ·24 | 4 | 7 | 72·5 | 16 | 31·2 | 7 | 1 | 1 |
| ,, | | Borrowdale (Seathwaite)..... | 17·30 | +10·32 | 6·78 | 8 | 15 | 76·5 | 23 | 31·5 | 1 | 1 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·79 | + ·19 | ·54 | 15 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 1·76 | — ·93 | ·39 | 2,7 | 11 | 77·0 | 24 | 31·0 | 20 | 1 | 7 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 3·45 | ... | 1·40 | 2 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·35 | — ·27 | ·50 | 14 | 7 | 75·2 | 11 | 40·0 | 3,7 | 0 | 0 |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 3·62 | + 1·09 | 1·09 | 8 | 16 | 73·8 | 23 | 30·0 | 7 | 1 | ... |
| ,, | | Hawick (Wilton Hill)..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 4·05 | + 1·71 | ·52 | 8 | 19 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·07 | + 2·31 | ·92 | 7 | 15 | 73·0 | 23 | 28·0 | 6 | 1 | ... |
| ,, | | Oban (Craigvarren) ..... | 3·73 | ... | ·65 | 15 | 16 | 73·0 | 24 | 35·0 | 7 | 0 | ... |
| ,, | | Mull (Quinish)..... | 3·53 | ... | ·42 | 21 | 18 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 3·60 | + 1·31 | ·60 | 2 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·65 | — ·12 | ·27 | 8 | 12 | 69·0 | 22 | 32·0 | 4 | 1 | ... |
| XVII. | | Braemar ..... | 1·80 | — ·62 | ·56 | 1 | 16 | 71·8 | 23 | 26·0 | 4 | 4 | 14 |
| ,, | | Aberdeen ..... | 1·42 | ... | ·25 | 14 | 13 | 73·0 | 22 | 29·0 | 6 | 2 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 1·82 | + ·04 | ·49 | 2 | 9 | 71·0 | 23 | 30·0 | 7 | 1 | 11 |
| XIX. | | Dunrobin ..... | 2·74 | ... | ·42 | 2 | 12 | 69·0 | 23 | 37·0 | 19*d* | 0 | ... |
| ,, | | Orkney (Sandwick) ..... | 2·08 | + ·21 | ·36 | 17 | 17 | 59·6 | 11 | 33·8 | 6 | 0 | 3 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 1·70 | — ·46 | ·55 | 13 | 14 | 79·0 | 24 | 35·0 | 17*e* | 0 | 0 |
| ,, | | Dromore Castle ..... | 4·63 | ... | ·81 | 8 | 14 | 71·0 | 27 | 35·0 | 20 | 0 | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·29 | ... | ·51 | 24 | 15 | 73·5 | 24 | 33·0 | 19 | 0 | 4 |
| ,, | | Killaloe ..... | 3·21 | ... | ·61 | 8 | 16 | 78·0 | 29*b* | 34·0 | 18 | 0 | ... |
| XXI. | | Portarlington ..... | 1·63 | — ·22 | ·29 | 25 | 18 | 75·0 | 24 | 37·0 | 5 | 0 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·36 | — ·36 | ·26 | 14 | 16 | 69·4 | 11 | 37·2 | 6 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 3·22 | + ·81 | ·82 | 8 | 16 | 69·0 | 24 | 35·0 | 6 | 0 | ... |
| XXI I | | Waringstown ..... | 2·36 | + ·25 | ·38 | 3,8 | 17 | 76·0 | 24 | 32·0 | 2 | 1 | 5 |
| ,, | | Londonderry (Creggan Res.). | 3·48 | ... | ·90 | 8 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·50 | + 1·15 | ·65 | 8 | 21 | 69·0 | ... | 37·0 | ... | 0 | ... |

+ Shows that the fall was above the average; — that it was below it.
*a* And 11. *b* And 30, 31. *c* And 21, 27. *d* And 21. *e* And 19.

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# METEOROLOGICAL NOTES ON MAY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The continued dry weather forced on the wheat, and rain was badly needed at the end of the month. Lilac in flower on 1st, mountain ash on 6th, horse chestnut on 20th; corncrake heard on 1st, orange tip butterfly seen on 17th.

BANBURY.—Mean temp. of the month 53°·3; no R fell after the 14th, L on four days, H on three days, high wind on five days, The oak was in leaf much before the ash; whitethorn remarkably full of blossom.

CULFORD.—The month was remarkably dry, and R was much needed at the close.

LANGTON HERRING.—A fine, dry, warm month; the temp. generally was higher than that of any May of the preceding twelve. T and L on 24th.

BODMIN.—Mean temp. of the month 56°·7.

WOOLSTASTON.—A dry month with much E. wind; mean temp. 51°·5.

ORLETON.—A very dry and fine month; the rainfall was less than one-third of the average, and nearly all of it fell in the first week. There were great fluctuations of temp., but the mean was about 1°·3 above the average of 23 years; on 11th, 23rd and 24th the temp. rose higher than it did on any day during last year. There were many days of brilliant sunshine, and a few frosty nights. Distant T was heard on 5th and 19th, and L was seen on 19th and 24th. The wind was generally strong, and frequently very rough. Apple trees were generally in blossom before the middle of the month.

LEICESTER.—The month was dry, no R falling (except a slight shower on 19th) after the 15th, and at the close of the month all vegetation much needed it. N. or N.E. winds prevailed almost without intermission after the 18th.

KILLINGHOLME.—The latter part of the month was cloudy and cold, with steady polar wind. Strong lands, both pasture and arable, and gardens were suffering much from drought at the close of the month, there having been no previous frosts to pulverize the soil.

ARNCLIFFE.—The month was unusually dry, E. winds prevailing.

SEATHWAITE.—The first part of the month was wild and very wet; the latter part hot and dry. During the first 17 days R fell daily with two exceptions: there were seven falls exceeding 1 in. in 24 hours, H fell on three days, S on one day, and L was seen on one day.

## WALES.

HAVERFORDWEST.—The weather during the first 16 days was variable, sometimes wet and often chilly and cold; the oak was in leaf on the 5th, the ash not until the 24th. On the whole the temp of the month was rather above the average; on 17 days the temp. did not reach 60°, it rose above 60° on 11 days, and above 70° on three days. The rainfall was disastrously small. Prevailing winds N.W. and E.N.E.; from 17th to 23rd a strong polar current prevailed, with much bright sky and sharp white frosts. A TS occurred on the evening of the 24th, and a man and some cattle were killed by L in this county. Cuckoo heard on 5th; whitethorn in blossom on 26th, unusually early for this locality.

## SCOTLAND.

CARGEN.—Wet and stormy up to the 17th, afterwards fine and dry, with prevailing E. winds; mean temp. about the average; duration of sunshine 23 hours less than the average. H on 2nd and 4th, L on 3rd and 5th, T on 5th and 19th.

CRAIGVARREN.—The month was dry and seasonable, and warmer than usual, in consequence trees and plants are more luxuriant than for many previous years, but grass is not so forward. There were two distinct periods of gales and rain, viz., from 1st to 3rd, and from 15th to 18th. T, L, and H on 1st.

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ABERDEEN.—Weather very dry during the month; rainfall nearly half an inch below the average.

CULLODEN.—The weather generally was cold, but the frosts were not severe enough to do any material damage.

SANDWICK.—The first seven days of May were cold with H and sleet showers, and Hoy Hill (1,500 feet) was white with S on 3rd; it was generally wet till the 17th, but after that date little R fell, and the temp. being warmer vegetation made great progress.

## IRELAND.

CORK.—The month for the most part was cold and ungenial; dry weather and cold winds made vegetation very backward.

DROMORE CASTLE.—No storms; vegetation good and crops very promising.

KILLALOE.—The first half of the month was chilly, showery, and gusty, but from the 16th to the close the weather was brilliant; no frosts; T on 17th.

DUBLIN.—In most respects this was a favourable month; mean temp. 52°·5, rather above the average, but there was a prevalence of low temperatures at night. The rainy days were one more than the average; there was no S or sleet, but H fell on six days; distant T on two days; L on 24th; solar halos on 12th, 21st, and 23rd. Mean humidity 75: mean amount of cloud 5·5.

EDENFEL.—The weather for the first fortnight was continuously wet, with strong westerly winds; the remainder of the month was fine, the last week being clear and warm.

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## HYDROLOGY AND HYDRO-GEOLOGY.

IN a review of the late General Belgrand's excellent work, *La Seine*, in Met. Mag., Vol. viii. (1873), p. 91, we expressed surprise at his defining the word "hydrologiques" as a new word, and pointed out that Beardmore had issued his *Manual of Hydrology* eleven years before. General Belgrand then wrote, pointing out that he had used the word in 1846, in an article in the *Annales des ponts et chaussées*, entitled "*Etudes hydrologiques dans les granits, &c., du bassin de la Seine.*" Can any one quote an earlier use of the word? It is quite clear that we were right in protesting against hydrology being regarded as a new word in 1873, for the above carries it back to 1846.

Hydro-geology is by many persons supposed to be a new term, but it is nearly a century old, as may be seen from the following title:—

"Lamarck, J. B. *Hydrogéologie ou Recherches sur l'influence qu'ont les eaux sur la surface du globe terrestre, &c.*, par J. B. Lamarck. 8vo. Paris, An. X. [1802]."

Lamarck's work, however, treats chiefly of the action of water on the surface—of subjects which, formerly were grouped as physical geography but, are now called physiographical, rather than of underground waters, to which the term hydro-geology has lately been applied.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXII.] JULY, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## ON THE ABSENCE OF DEW BENEATH A CLOUDLESS NOCTURNAL SKY.

By CHARLES TOMLINSON, F.R.S.

MANY of the most striking phenomena of Nature had been accurately observed long before they were generalized or reduced to law. Thus the ancients noticed that dew is formed abundantly on clear moonlight nights, and they attributed its formation to the action of the moon, naming that luminary *rorifera luna*, or dew-making moon. There is also a beautiful passage in Tasso's *Gerusalemme* (VI. 103), which embodies a similar idea, namely, that the moon produces the cold.

*Era la notte, e'l suo stellato velo*
*Chiaro spiegava, e senza nube alcuna:*
*E già spargea rai luminosi, e gelo*
*Di vive perle la sorgente Luna.*

Which may be thus closely translated:

It was the Night, and she, her starry veil
Unfolded clearly in the cloudless air;
The rising Moon now shed her radiance pale,
And frost of living pearls was scattering there.

The nocturnal formation of dew during warm dry weather is so necessary to the well-being of vegetable life, that the absence of it during periods of drought is attended with loss and inconvenience.

Such occasions must be comparatively rare, I suppose, in this country; but some years ago, in the month of August, I paid a visit to my late brother-in-law, the Rev. H. Windsor, at his Vicarage, at Kensworth, near Dunstable, during a time of severe drought. There had been no rain for some weeks, and the usual prayer for rain had been offered up in the church.

The Vicarage is situate on clay at the edge of a valley of denudation, extending east and west. The lowest part of the valley consists



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of gravel on chalk; on the south flank, clay with veins of gravel; and on the north, clay and chalk. The width of the valley is about 360 yards.

Three sets of observations were made with thermometers resting on the ground, and suspended 3½ feet in the air. The first set, A, was in the Vicarage field, where the grass was much burnt up; the second set, B, at the lowest point of the valley, amidst scanty clover and dry, withered vegetation; the third set, C, was in the Vicarage kitchen-garden.

In A, at 2 p.m., the upper thermometer reading was 82° F, and the lower 115°. At 10 p.m. the readings were 48° and 42°, with no appearance of dew on the ground, and a clear, calm sky above.

The observations, B, in the valley may be given more in detail:—

| 11th August. | 3½ ft. above ground. | On ground. |
|---|---|---|
| Sun on—11.30 a.m. | 69½° | 82° |
| 1 p.m. | 75 | 96 |
| 4 | 72 | 90 |
| 5 | 68 | 75½ |
| 6 | 62 | 62½ |
| 7 | 55 | 53 |
| Sunset—7.30 | 49 | 48 |
| Clear sky—7.45 | 47 | 46 |
| 8 | 43½ | 45 |
| 8.30 | 45 | 42 |
| 9 | 42 | 42 |
| 10 | 41 | 39 |

The observations, C, call for no particular remark. At 10 p.m. the readings were 47° and 44°.

On the 12th August, the readings at B in the valley were taken every quarter of an hour from 7 to 9 p.m., as follows:—

| | 3½ ft. above ground. | On ground. |
|---|---|---|
| 7 p.m. | 68° | 66° |
| Sunset— .15 | 66 | 63 |
| .30 | 63½ | 60½ |
| .45 | 61½ | 57½ |
| 8 | 58½ | 56 |
| .15 | 56 | 55 |
| .30 | 54½ | 54 |
| .45 | 53½ | 53½ |
| 9 | 52½ | 52 |

On crossing the fields at 10 p.m. there was a bright moon in the south, and a cloudless sky, as it had been for some hours, but there was no trace of dew. The grass in a meadow on the opposite side of the valley was quite dry to the touch on sweeping the hand over it; the turnips and clover in the valley were singularly cold to the touch, but not at all wet or even moist. In the Vicarage field the grass was not so much burnt as on the opposite side, but there was no trace of wet. The hand swept over it imparted a keen sense of cold, but not of moisture.

On the 15th, a very curious observation was made on a grass plot near the house surrounded by trees. In the evening, after the sun

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had been off the plot for some hours, the grass was still warmer than the air, the readings being 64° and 60°.

On the 16th August, at 7.40 p.m., the readings were 58° and 56°. There were two ground thermometers—one on a growing turnip leaf, and another on the mould by the side, but both read 56°. The ground was warm to the touch, but the turnip leaf uncomfortably cold: no moisture was perceptible. At 7.50 the three readings were

57° 55° 55°

The leaves of the turnips (swedes) were so cold and clammy, that it was difficult to persuade one's self that they were not wet; but the feeling of moisture proceeded probably from the warm hand. Next morning the register left on the mould marked 50°, and a few scanty beads of dew were noticed on the turnip leaves.

It should be remarked that in a miniature glade of grass, formed by a few trees, the grass had maintained its freshness, and had traces of scanty dew late at night.

On the 17th, the readings in the valley, at 8 p.m., were 48° and 46°; and next morning scanty beads of dew, formed doubtless some hours later, were observed on the swedes.

During these observations the greatest difference between the dry and wet bulbs was 11°, viz., 75° and 64°, corresponding to 4·9 grains of vapour in a cubic foot of air.

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## ROYAL METEOROLOGICAL SOCIETY.

THE concluding monthly meeting of this Society for the present Session was held on Wednesday evening, the 18th inst., at the Institution of Civil Engineers; Mr. R. H. Scott, F.R.S., President, in the chair. Dr. Benjamin A. Gould, Director of the Cordova Observatory, Argentine Republic, was elected an honorary member. The following papers were read:—

(1.) "The Equinoctial Gales—Do they occur in the British Isles?" By Mr. R. H. Scott, F.R.S. The period investigated was the fourteen years 1870–84, and only those storms were selected which had attained force 9 of the Beaufort scale at more than two stations. The results show that the storms are all but exclusively confined to the winter half-year; and also that, for a certain interval, the stream of storm depressions sets over the British Isles, and then for a time takes another path, leaving this country at rest. In some years there are as many as four or five storms in a fortnight; and in others, there are none, or only one. It is further shown that there is no strongly-marked maximum at either equinox.

(2.) "On the physical significance of concave and convex barographic or thermographic traces." By the Hon. R. Abercromby, F.R. Met. Soc. The author shows that a falling barogram is convex when the rate of the fall is increasing, concave when decreasing;



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and conversely, that a rising barogram is convex when the rate is decreasing, concave when increasing. As the rate of barometric change is proportional to the steepness of the gradients which are passing, and the wind also depends on the gradients, the author suggests the following rules for judging the coming force of a gale, from the inspection of a barogram :—A convex barogram is always bad, with a falling barometer, and good with a rising one; and a concave trace is sometimes a good sign with a falling barometer, and not always a bad indication with a rising one. The convexity or concavity of a thermogram is likewise shown to depend on the rate of thermal change. A method is given by which the distribution of diurnal isothermals over the globe can be deduced from the diurnal thermograms in different latitudes; and it is shown that the shape of diurnal isotherms on a Mercator chart, for a limited number of degrees of latitude, is similar to the shape of the curve of diurnal temperature range, if we turn time into longitude, and temperature into latitude, on a suitable scale.

(3.) "Maritime losses and casualties for 1883, considered in connection with the weather." By Mr. C. Harding, F.R. Met. Soc.

(4.) "The Helm Wind." By the Rev. J. Brunskill, F.R. Met. Soc. This is an account of a wind peculiar to the Crossfell range; and its presence is indicated by a belt of clouds, denominated the "helm," which settles like a helmet over the top of the mountain, and a "helm bar," which forms a line parallel therewith.

(5). "Climate of the Delta of Egypt in 1798 to 1802 during the French and British Campaigns." By Surgeon-Major W. T. Black, F.R. Met. Soc. The author has collected and discussed the meteorological observations made in Egypt during the French and British Campaigns at the beginning of the present century.

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On the previous evening (Tuesday), a large number of the Fellows dined together at the Holborn Restaurant to commemorate the favour recently granted by Her Majesty the Queen of according to the Society permission to adopt the prefix "Royal." Mr. R. H. Scott, F.R.S., the President, occupied the chair, and gave the toast of the "Queen and Royal Family." Dr. R. J. Mann proposed "The Royal Meteorological Society," to which Mr. G. J. Symons, F.R.S. (Secretary), responded. Mr. P. Phipps, M.P., gave the health of the "President," to which Mr. Scott replied. The remaining toasts were "The Officers of the Council," proposed by Mr. H. S. Eaton, and responded to by Dr. Tripe (Secretary); "The Visitors," proposed by Mr. J. K. Laughton, coupled with the name of Mr. R. McLachlan, F.R.S., and the "Lady Fellows of the Society," proposed by Prof. E. D. Archibald, and acknowledged by Mr. H. Perigal (Treasurer).

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# ON HYGROMETRY.

By M. JULES JAMIN.

[WE are indebted to Mr. R. H. Scott for calling attention to a very important memoir on the above subject by the eminent French physicist, M. Jules Jamin, and also for the loan of the "*Comptes Rendus*" for June 30th, 1884, in which it is published. We at present limit ourselves to printing a translation *in extenso*.—ED.].

M. Mascart publishes annually in the *Annales du Bureau Météorologique de France* the observations made at nearly a hundred stations spread over the whole country, and the same is done by every state in Europe. These documents are precious stores of meteorological facts whence every one can draw. I have already extracted the pressure of the layer of atmosphere between the base and the summit of the Puy de Dôme; I am now going to make some general remarks upon hygrometry.

On looking over the table of relative humidity, one is astonished at its uniformity. The means for all months, and for all seasons, are nearly alike. Thus we have for Clermont Ferrand for noon during 1880—

| Feb. | June. | Aug. | Sept. | Oct. |
|---|---|---|---|---|
| 593 | 599 | 570 | 569 | 622. |

It is obvious that there must be great differences between the hygrometric condition of the air in February and in August; therefore if the tables do not show much difference it is probable that the system of reduction is faulty.

This system consists in expressing the relation $\frac{f}{F}$ of the observed elastic force $f$, to the maximum force $F$, which the vapour would have at the same temperature if the air were saturated; this is known as relative humidity. Now for a given air, of permanent composition, the quotient $\frac{f}{F}$ varies, (1) with the proportion of vapour; (2), with the altitude and barometric pressure, since $f$ is proportional to this pressure; (3) and chiefly with the temperature which changes the value of $F$; it is therefore a function of three independent variables, it is especially a function of $t$, and one cannot hope that it will render evident variations in the quantity of vapour. In order to recognize them it is necessary to eliminate the disturbing influences of pressure of altitude and of temperature, but that is easily done.

When chemists are analyzing air, they determine the proportions of oxygen, nitrogen, and carbonic acid; to be logical they should add the proportion of watery vapour. Since this vapour is a gas obeying the same laws as other gases, with reference to expansion and contraction, there is no reason for measuring it differently.

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Let $f$* be the vapour tension, $H$ the total atmospheric pressure, $H-f$ that of dry air we have—

$$\text{Weight of vapour} \ldots \quad P = \frac{v\,(1\ ^{gr}\cdot 293)\,(0{\cdot}622)\,f}{(1+ar)\,760.}$$

$$\text{Weight of dry air} \ldots \quad P' = \frac{v\,(1\ ^{gr}\ 293)\,(H-f)}{1+at\,760.}$$

$$\frac{P}{P'} = 0{\cdot}622\ \frac{f}{H-f}$$

$\frac{P}{P'}$ is then the relation of the weight of vapour to that of dry air, it is independent of pressure and temperature, since $f$ and $H-f$ follow the same laws, it varies only with the proportion of vapour and measures it; it expresses *hygrometric richness* in weight, and $\frac{f}{H-f}$ measures its volume.

It must be noticed that observations do not give directly the relation usually preserved, $\frac{f}{F}$. In fact the condensation hygrometer measures $f$, which is a function of the pressure and therefore of the altitude; the dry and wet bulb hygrometer determines $\frac{F'-f}{H}$; but a calculation has to be made in order to pass from the facts observed, and which may then be forgotten, to the function $\frac{f}{F}$, the only thing which is preserved; but the introduction of $F$ brings in the variations due to temperature which cover the influence of vapour and complicate the result. It would not be more difficult to calculate $\frac{f}{H-f}$ and to keep it only for calculation, preserving only $\frac{f}{F}$; one would thus replace a complex function, which teaches nothing, by the precise weight or volume of the hygrometric component of the atmosphere.

I therefore propose that in meteorological tables *relative humidity*, $\frac{f}{F}$, should be replaced by *hygrometric richness* $\frac{f}{H-f}$

In order to justify this proposal, I will give you one example. I select the measures made at Clermont Ferrand in 1880, by M. Alluard, and published in the *Annales Météorologiques*. No very marked differences are to be found in the different months; the values decrease from morning up to 3 p.m., which (as M. Angot has shown) proves the influence of temperature, but there is no evidence of changes of humidity.

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* To avoid confusion we have adopted M. Jamin's notation, and left the formulæ unconverted, *i.e.*, in metric units.

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CLERMONT—*Relative Humidity.*

| | 6 a.m. | 9 a.m. | Noon. | 3 p.m. | 6 p.m. | 9 p.m. |
|---|---|---|---|---|---|---|
| Janvier | 85·3 | 89·6 | 79·5 | 79·5 | 89·6 | 90·3 |
| Février | 80·4 | 71·6 | 59·2 | 54·7 | 74·3 | 77·7 |
| Mars | 83·9 | 59·8 | 68·3 | 39·0 | 52·6 | 69·5 |
| Avril | 81·9 | 71·6 | 63·7 | 61·5 | 71·5 | 76·6 |
| Mai | 75·9 | 58·7 | 49·3 | 49·3 | 54·7 | 70·8 |
| Juin | 82·5 | 64·4 | 58·9 | 58·1 | 65·2 | 81·2 |
| Juillet | 79·8 | 60·1 | 48·0 | 47·4 | 57·5 | 79 3 |
| Août | 86·9 | 66·2 | 57·0 | 57·9 | 71·6 | 83·8 |
| Septembre | 88·6 | 67·9 | 56·9 | 55·1 | 73·3 | 83·4 |
| Octobre | 84·9 | 74·2 | 62·9 | 62·2 | 78·7 | 85·5 |
| Novembre | 88·2 | 80·8 | 70·4 | 73·0 | 82·6 | 85·4 |
| Décembre | 81·7 | 77·2 | 70·8 | 69·7 | 79·1 | 82·6 |

The following is the same table modified by the substitution of $\frac{f}{H-f}$ for $\frac{f}{F}$. To avoid decimals the results have been multiplied by 100,000.

[With every respect for M. Jamin, we are bound to point out that the following is *not* the same table. The former gives the observations at only Clermont Ferrand, *i.e.*, at the base of the mountain; the following table gives both the Clermont Ferrand values (called the Plain). and those for the Puy de Dôme (called the Summit).—ED. *M. M.*]

| | | 6 a.m. | 9 a.m. | Noon. | 3 p.m. | 6 p.m. | 9 p.m. | $\frac{F}{H-F}$ |
|---|---|---|---|---|---|---|---|---|
| Janvier | Plaine | 410 | 444 | 526 | 560 | 500 | 459 | 380 |
| | Sommet | 473 | 395 | 439 | 458 | 437 | 446 | 514 |
| Février | Plaine | 606 | 660 | 727 | 715 | 727 | 696 | 646 |
| | Sommet | 609 | 607 | 671 | 657 | 626 | 626 | 617 |
| Mars | Plaine | 635 | 776 | 862 | 749 | 795 | 814 | 666 |
| | Sommet | 663 | 676 | 715 | 733 | 712 | 688 | 779 |
| Avril | Plaine | 842 | 932 | 946 | 945 | 967 | 898 | 876 |
| | Sommet | 740 | 756 | 791 | 807 | 775 | 535 | 687 |
| Mai | Plaine | 981 | 1019 | 1001 | 1012 | 979 | 969 | 917 |
| | Sommet | 831 | 868 | 877 | 883 | 868 | 830 | 823 |
| Juin | Plaine | 1249 | 1268 | 1291 | 1270 | 1278 | 1497 | 1106 |
| | Sommet | 973 | 1036 | 1099 | 1130 | 1094 | 1023 | 944 |
| Juillet | Plaine | 1534 | 1607 | 1566 | 1567 | 1668 | 1599 | 1377 |
| | Sommet | 1240 | 1304 | 1384 | 1427 | 1402 | 1380 | 1354 |
| Août | Plaine | 1482 | 1588 | 1581 | 1611 | 1808 | 1663 | 1318 |
| | Sommet | 1267 | 1348 | 1383 | 1428 | 1426 | 1452 | 1250 |
| Septembre | Plaine | 1269 | 1472 | 1460 | 1435 | 1499 | 1418 | 1137 |
| | Sommet | 1129 | 1173 | 1128 | 1264 | 1275 | 1263 | 1125 |
| Octobre | Plaine | 1092 | 1109 | 1108 | 1125 | 1139 | 1115 | 946 |
| | Sommet | 900 | 896 | 945 | 981 | 985 | 810 | 926 |
| Novembre | Plaine | 674 | 719 | 770 | 783 | 727 | 714 | 649 |
| | Sommet | 627 | 618 | 650 | 650 | 639 | 630 | 599 |
| Décembre | Plaine | 644 | 715 | 832 | 930 | 812 | 816 | 765 |
| | Sommet | 658 | 669 | 702 | 724 | 699 | 663 | 665 |

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We see immediately from this last table—

(1). That hygrometric richness increases from morning till noon, or 3 p.m., and afterwards decreases as the sun descends, and during the night; this is due to two causes, to evaporation during the day, and to the expansion of the atmosphere.

(2). That the richness increases from January to July or August, and then decreases; that it varies from 0·005 to 0·018, that is to say that it is three or four times greater in summer than in winter. We find also that it increases in hot countries, and is even greater at Laghouat than at Marseilles; hence we must conclude with M. Dove that there is less dry air in summer than in winter in the northern hemisphere.

(3). The hygrometric capacity of the air, that is to say the maximum of vapour which it can contain, is expressed by $\frac{F}{H-F}$ Now temperature and $F$ decrease with elevation; on the other hand $H$ decreases equally [? Ed.]. These are two inverse causes of variation; experience shows that the capacity decreases but very slowly. Similarly the richness is always rather less at the summit of the Puy de Dôme than at its base.

(4). The last column of the table measures the total capacity during the night during the period of lowest temperature. It is generally greater than the richness at 6 a.m., but not always, whence we may conclude that the air is saturated at all heights when the temperature is at its minimum. This explains all the condensations of vapour which generally take place at night.

To sum up; the values of $\frac{f}{F}$ only teach us the degree of dryness or relative humidity; they do not measure the quantity of vapour. On the contrary, the relation $\frac{f}{H-f}$ measures the hygrometric composition of the air, and brings out the changes produced by day, night, summer and winter, at various altitudes and latitudes.

This is why, I repeat, that it would be well to suppress the values of $\frac{f}{F}$ and to substitute for them $\frac{f}{H-f}$. M. Mascart and M. Angot have been good enough to undertake the calculations which this will involve, and the results will be published in the *Annales du Bureau Central Météorologique*, after having been communicated to the Academy.

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## REMARKABLE RAIN.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainfall of Saturday night and Sunday morning, the 28th and 29th of June, must be reckoned among the heaviest falls that have been observed here. Between 10.30 p.m. on Saturday, and 9 a.m. on Sunday, there fell no less than 2·44 inches. The temperature on Saturday reached a maximum of 85°·1. The movements of the barometer were comparatively trifling, the total fall between 9 a.m. on Saturday and 9 a.m. on Sunday being about 15 hundredths of an inch. The rain fell in very heavy storms, and was accompanied with a good deal of lightning and thunder.

The following are the most remarkable falls of rain previously recorded here :—

On March 11–13, 1859, 3·04 inches fell in 48 hours.

On August 6, 1865, 2·68 inches fell in 24 hours, and of this about 2½ inches fell within four hours.

On July 14–15. 1875, 3·08 inches fell in 38 hours, and about 2·9 inches in 24 hours.

On October 21–24, 1882, about 3·7 inches fell within an interval of 60 hours. GEORGE F. BURDER.

*Clifton, June 30th, 1884.*

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## HYDROLOGY.

*To the Editor of the Meteorological Magazine.*

SIR,—The word "hydrology" was used in the last century, for J. G. Wallerius published at Stockholm, in 1748, a work entitled *Hydrologia, eller Beskrifning af Vatten Riket.* See Poggendorff, Biog.-lit. Handwörterbuch, t. II., p. 1252.—Yours faithfully,

A. LANCASTER.

*Bruxelles, June 26th, 1884.*

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[Our Belgian friends are always to the front in bibliographical matters, and M. Lancaster in the above note carries the employment of the word back nearly a century. We have never seen the above work, and it does not appear in any printed catalogue in our possession. We cannot recollect whether or not it is in the MS. catalogue sent to the United States Signal Office, and the only reference to it in our own MS. catalogue is the apparently incomplete one :—

WALLERIUS, J. G.—Hydrologia, eller Watturiket, *Stockholm*, 1748.

There seem to be three editions of it, for M. Lancaster quotes the title in Danish, and the following extract from the Royal Society Catalogue implies that it was printed in German and translated into French :—

WALLERIUS, Johan Gotsch. — Minéralogie, ou description du Regne Mineral. Ouvrage traduit de l'Allemand. Tome 2. [Minéralogie with Supplement and Hydrologie.] 2 parts in 1 vol. 8vo, Paris, 1753–59.—ED.]

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DEC., 1883.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 54·9 | 13 | 28·3 | 7 | 44·9 | 36·4 | 36·6 | 89 | 72·3 | 23·7 | ·75 | 14 | 7·4 |
| Malta | 68·5 | 9 | 42·8 | 27 | 60·4 | 50·9 | 46·5 | 74 | 110·2 | 36·5 | 4·06 | 12 | 4·8 |
| *Cape of Good Hope* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Mauritius* | 85·0 | 5 | 64·8 | 15 | 82·2 | 72·5 | 68·3 | 76 | 137·6 | 55·8 | 4·02 | 13 | 6·3 |
| Calcutta | 78·8 | 3 | 46·7 | 24 | 73·2 | 53·9 | 53·1 | 73 | 136·5 | 36·6 | 2·54 | 2 | 2·0 |
| Bombay | 85·6 | 11 | 63·0 | 17 | 82·6 | 66·5 | 59·5 | 61 | 136·5 | 46·2 | ·00 | 0 | 1·6 |
| Ceylon, Colombo | 86·2 | 5 | 68·1 | 29 | 84·6 | 71·6 | 68·6 | 73 | 146·5 | 63·0 | 7·32 | 8 | 7·5 |
| *Melbourne* | 99·3 | 29 | 46·2 | 4 | 74·7 | 54·0 | 48·8 | 61 | 157·0 | 36·0 | 1·60 | 12 | 5·9 |
| *Adelaide* | 100·0 | 28 | 49·5 | 25 | 80·7 | 58·7 | 49·0 | 48 | 158·9 | 40·4 | ·90 | 10 | 3·4 |
| *Wellington* | 72·3 | 18 | 43·3 | 10 | 64·0 | 50·9 | ... | ... | 140·0 | 40·0 | 3·53 | 12 | ... |
| *Auckland* | 76·0 | 28 | 50·0 | 30 | 67·3 | 56·4 | 52·6 | 72 | 147·0 | 42·0 | 4·33 | 19 | 6·9 |
| *Falkland Isles* | 60·8 | 9 | 32·1 | 21 | 51·0 | 38·7 | 38·9 | 75 | ... | ... | 3·18 | 21 | 6·8 |
| Jamaica | 89·8 | 19 | 63·6 | 10 | 85·6 | 68·3 | 67·9 | 78 | ... | 56·3 | ·17 | ... | 4·7 |
| Barbados | 81·0 | 1* | 69·0 | var. | 79·0 | 71·0 | 73·0 | 86 | 143·0 | 65·0 | 5·48 | 17 | 6·0 |
| Toronto | 48·7 | 12 | —4·0 | 23 | 33·1 | 18·5 | 24·0 | 82 | 97·0 | —10·0 | 1·46 | 22 | 8·1 |
| New Brunswick, Fredericton | 43·9 | 8 | 24·0 | 23 | 29·3 | 5·6 | 16·5 | 88 | ... | ... | 3·34 | 17 | 6·3 |
| Manitoba, St. Andrews | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| British Columbia, Yale | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 10 and 11.

### REMARKS, DECEMBER, 1883.

MALTA.—Violent gale on 13th; from noon to 3 p.m. the wind maintained a velocity of 45 miles an hour, and in a violent gust part of a stone wall was thrown down; Mean temp. 55°·0; temp. of sea ranged from 67° to 61°; mean hourly velocity of wind 11·9. J. SCOLES.

*Mauritius.*—Rainfall 1·96 in., and mean temp. 0°·5 below average; mean hourly velocity of wind 10·6 miles, extremes 50 miles and 0 miles, direction S.E. to N.E. L on 4 days, T and L on 3 days. Unusual sunsets and sunrises were observed more or less during the whole month, but not so intense as in September and October. Generally there were two red glows. The first commenced at 14m. after sunset, and lasted about 24m., and the second commenced at 38 m. after sunset, and lasted till 1h. 17m. after sunset. In the morning the first red glow began about 1h. 26m. before sunrise. All the prismatic colours were observed, especially on December 8th and 10th. By January 28th, the phenomenon had nearly disappeared, the principal and almost only colours being yellow and orange. The secondary illumination had ceased. C. MELDRUM, F.R.S.

*Ceylon.*—Thunder on 4 days. J. H. SYMONDS.

*Melbourne.*—Mean temp., pressure, and humidity all about the average; rainfall ·79 in., and temp. of dew point 1°·5 below the average; prevailing winds S. and W.; strong breezes on 9 days; heavy dust storm on 5th; hot wind on 29th; T and L on 3 days, and T or L alone on 4 other days. R. L. J. ELLERY, F.R.S.

*Adelaide.*—An unusually low bar. reading occurred on 11th, accompanied by a dust storm (believed to be the heaviest since 1851), and followed in the evening by a heavy TS with destructive H; the mean temp. (69°·7) was 1°·3 below the average, and the max. was unusually low. The average amount of cloud was slightly below the average, but the rainfall and wet days were rather in excess. C. TODD.

*Wellington.*—Up to the 19th it was generally fine, but at times dull, and there was some strong wind; the 10th and 11th were stormy, and after the 19th the weather was showery, squally, and unpleasant; mean temp. 3°·7 below the average, rainfall slightly below it. R. B. GORE.

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*Auckland.*—Weather on the whole cold, wet, and unseasonable; pressure and temp. considerably below the average; rainfall largely in excess.—T. F. CHEESEMAN.

*Falkland Isles.*—Snow fell for several hours on 21st, a most unusual occurrence. F. E. COBB.

BARBADOS.—Mean temp. (75°·0) the same as the 23 years average; wind from N.E. all the month but two days.; mean hourly velocity 11 miles, extremes 20 miles and 2 miles; rainfall and evaporation very near the average. R. BOWIE WALCOTT.

## SEVERE THUNDERSTORMS.

*To the Editor of the Meteorological Magazine.*

SIR,—The violent thunderstorms of the past ten days have done immense mischief in this neighbourhood, and the local newspapers are full of records of casualties and accidents of different descriptions, which it would be impossible to enumerate in your pages.

When I mention that on Friday, the 4th inst., I calculated that upwards of two hundred flashes struck objects within five hundred yards of this house, and that in my own small garden, which, inclusive of my house, occupies scarcely one acre of ground, two flashes have, during the series of storms, struck and injured the trees, you will admit that the bombardment was somewhat hot.

On the 4th inst., at 1.30 p.m., a thunderstorm slowly formed in south-west by south. The sky shortly afterwards became one of remarkable grandeur. The Cirrus, pouring off the summit of the storm, spread in the form of a half-open fan, far past the zenith to the north-north-east, the ice-cloud hanging in dense tubercles. That the altitude of these tubercles was upwards of five miles could be ascertained, when the storm was about four miles distant by the time interval of the thunder. The flashes were not then too numerous to admit of this calculation. The thunder after each flash was first heard in the direction of the storm, then rolled through the zenith, and was last heard in the direction of the clear sky in the north-north-east. From the duration of the claps, as well as from other data, it is certain that the fan-shaped conducting cloud extended for a distance of more than fourteen miles in front of the storm.

The storm, which occupied the centre or apex of the fan, increased enormously in intensity, and by the time it had reached this place the flashes were unusually frequent, sometimes three, and at one time four occurring in a second. A light Easterly breeze, which had prevailed before the storm, gave way, as usual, to a strong South-West squall during its passage, but returned, soon after the storm had passed to the North-Eastward.

One episode, which occurred while the storm was at its height, is perhaps worth mentioning. A flash just missed my kitchen-chimney and struck an elm-tree in the kitchen-garden, twenty-five yards from the house. From this it passed through the boughs to another tree, down which it stripped the bark, until it arrived opposite the wet thatch of a cowshed, through which it passed to the ground. Two cows belonging to me were in the shed at the time, fastened by iron chains round their necks. One of the animals escaped uninjured, the other was knocked down senseless. I had her dragged out into

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the meadow, where, as soon as the storm had cleared, she was surrounded by a ring of agriculturists and members of the grazing interest. Each of these proposed a different remedy, but all agreed that death was in any case inevitable, for the all-sufficient reason that, though they had all seen animals killed, they had never previously happened to see one only paralysed, by lightning. Three-quarters of an hour after the accident, the cow got up and walked about, though with stiff limbs and neck.

On the 8th inst., another severe thunderstorm arose from the same quarter, under similar meteorological conditions, and passed over this village at the same hour, 3.30 p.m., the cannonnade being again very close.

On the 9th, incessant thunder commenced in the east-south-east, at 1.30 p.m., and soon after in the S.E. and S. The part of this storm which was in south-south-east came over this place at 3.30, and was most exceptionally severe. The nearest flash struck a large elm in my carriage drive, passing into my front gate, which is of iron, and hurling pieces of bark nearly to the front door, as well as against some houses on the other side of the road.

All the storms of this period were preceded by the "Turret-cloud," which I have described in *Modern Meteorology*, p. 131-133.—Yours very truly, W. CLEMENT LEY.

*Ashby Parva, Lutterworth, July 13th.*

[We shall be glad of newspaper and other reports of damage by these storms.—ED.]

## A HEAVY INDIAN RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—I may mention that twenty years ago I was well acquainted with the locality in India where the great fall of rain, recorded at page 76 of your last number took place; and that very soon after the line of rail was opened from Bosawul for a few miles towards Jubbulpoor, a similar fall of rain took place, which carried away a bridge, and part of a village, which had stood in the same spot above a century. The train coming up soon after the catastrophe, was precipitated into the torrent, and all (I think) were lost, including Holkar's minister. My impression is that this took place at the Sookee Nullah, which is mentioned at page 76; at all events, it was not many miles from Bosawul, for the line was then open for only about 30 miles above that junction. Exact information could be given of this by the Company.

There was also a similar fall about 100 miles higher up the line, about the same time, which carried away the Towah bridge in its early stages, when that river rose in the gorge about 90 feet in a few hours.

But such storms are rare. Personally I never recorded, or saw recorded above some seven inches of rain in that part of India in 24 hours, during several years of residence there in the Forest department.—Your obedient Servant, C. PEARSON, LIEUT.-COL.

*Downton, Kington, New Radnor.*

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# SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·99 | XI. | Carno, Tybrith ... ..... | 1·40 |
| ,, | Margate, Birchington... | ·71 | ,, | Corwen, Rhug ..... | 1·89 |
| ,, | Littlehampton ..... | 1·15 | ,, | Port Madoc ..... | 1·43 |
| ,, | Hailsham ..... | 2·44 | ,, | I. of Man, Douglas ..... | ·69 |
| ,, | I. of W., St. Lawrence. | 2·00 | XII. | Stoneykirk, Ardwell Ho. | ·55 |
| ,, | Alton, Ashdell..... | 2·00 | ,, | Melrose, Abbey Gate... | ·88 |
| III. | Winslow, Addington ... | 1·32 | XIII. | N. Esk Res. [Penicuick] | 1·45 |
| ,, | Oxford, Magdalen Col... | 2·05 | XIV. | Ayr, Cassillis House ... | ·98 |
| ,, | Northampton ..... | ·66 | ,, | Glasgow, Queen's Park. | ·77 |
| ,, | Cambridge, Beech Ho... | 1·19 | XV. | Islay, Gruinart School.. | ·71 |
| IV. | Southend ..... | 1·21 | XVI. | St. Andrews, Newton Bk | ·40 |
| ,, | Harlow, Sheering ... .. | 1·67 | ,, | Balquhidder, Stronvar.. | 1·69 |
| ,, | Diss ..... | ·95 | ,, | Dunkeld, Inver Braan.. | ·39 |
| ,, | Swaffham ..... | ·99 | ,, | Dalnaspidal H.R.S. ... | 1·17 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 2·07 |
| V. | Salisbury, Alderbury... | 2·86 | ,, | Forres H.R.S. ..... ... | 1·04 |
| ,, | Warminster ..... | 3·90 | XVIII. | Strome Ferry H.R.S.... | 3·13 |
| ,, | Calne, Compton Bassett | 2·75 | ,, | Lochbroom ..... | 1·60 |
| ,, | Ashburton, Holne Vic.. | 1·07 | ,, | Tain, Springfield..... | ·92 |
| ,, | Holsworthy, Clawton... | 1·67 | ,, | Loch Shiel, Glenaladale | 4·42 |
| ,, | Lynmouth, Glenthorne. | 2·02 | ,, | Invergarry ..... | 1·47 |
| ,, | Probus, Lamellyn ..... | 2·34 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Wincanton, Stowell Rec. | 2·94 | ,, | Forsinard H.R.S. ..... | 1·38 |
| ,, | Taunton, Fullands ..... | 2·42 | ,, | Watten H.R.S. ..... | 1·29 |
| VI. | Bristol, Clifton ..... .. | 3·87 | XX. | Dunmanway, Coolkelure | ·95 |
| ,, | Ross ..... | 4·05 | ,, | Fermoy, Gas Works ... | 1·70 |
| ,, | Wem, Sansaw Hall..... | ... | ,, | Tralee, Castlemorris ... | 1·26 |
| ,, | Cheadle, The Heath Ho. | 2·06 | ,, | Tipperary, Henry Street | ·55 |
| ,, | Worcester, Diglis Lock | 2·74 | ,, | Newcastle West ..... | ·60 |
| ,, | Coventry, Coundon ..... | 2·15 | ,, | Miltown Malbay..... | 1·37 |
| VII. | Melton, Coston ..... | ·96 | ,, | Corofin ..... | 1·14 |
| ,, | Ketton Hall [Stamford] | ·72 | XXI. | Carlow, Browne's Hill.. | ·84 |
| ,, | Horncastle, Bucknall ... | ·45 | ,, | Navan, Balrath ..... | 1·03 |
| ,, | Mansfield, St. John's St. | ·87 | ,, | Mullingar, Belvedere ... | 1·08 |
| VIII. | Macclesfield, The Park. | 1·31 | ,, | Athlone, Twyford ..... | ·85 |
| ,, | Walton-on-the-Hill..... | 1·39 | XXII. | Galway, Queen's Col.... | ·90 |
| ,, | Lancaster, South Road. | ·90 | ,, | Clifden, Kylemore ..... | 2·47 |
| ,, | Broughton-in-Furness .. | ·74 | ,, | Crossmolina, Enniscoe.. | 1·02 |
| IX. | Wakefield, Stanley Vic. | ·61 | ,, | Carrick-on-Shannon ... | ·49 |
| ,, | Ripon, Mickley ..... | 1·04 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | ·47 | ,, | Rockcorry..... | 1·49 |
| ,, | East Layton [Darlington] | ·63 | ,, | Warrenpoint ..... | ·39 |
| ,, | Middleton, Mickleton .. | ·21 | ,, | Newtownards ..... | 1·25 |
| X. | Haltwhistle, Unthank.. | ·60 | ,, | Belfast, New Barnsley . | ·90 |
| ,, | Shap, Copy Hill ..... | ·64 | ,, | Cushendun ..... | ·71 |
| XI. | Llanfrechfa Grange ..... | 2·20 | ,, | Bushmills ..... ..... | ·81 |
| ,, | Llandovery ..... | 2·99 | ,, | Stewartstown ..... | 1·60 |
| ,, | Lower Solva ..... | ·24 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 1·42 | ,, | Buncrana ..... | 1·35 |
| ,, | Rhayader, Nantgwillt.. | 2·10 | ,, | Carndonagh ..... | ·65 |

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# JUNE, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) | 2·84 | + ·17 | 1·47 | 5 | 7 | 81·7 | 27 | 40·6 | 1 | 0 | 1 |
| II. | | Maidstone (Hunton Court) | 1·17 | — ·90 | ·32 | 4 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 2·50 | + ·40 | ·90 | 6 | 8 | 83·3 | 28 | 33·9 | 1 | 0 | 0 |
| III. | | Hitchin | 1·39 | — ·74 | ·47 | 5 | 10 | 78·0 | 27 | 42·0 | 7,14 | 0 | ... |
| ,, | | Banbury | 1·87 | — ·57 | ·75 | 28 | 8 | 80·0 | 27*a* | 34·0 | 1 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·33 | — ·94 | ·50 | 6 | 9 | 82·0 | 28 | 37·0 | 16*b* | 0 | ... |
| ,, | | Norwich (Cossey) | ·51 | — 1·71 | ·16 | 8 | 9 | 80·0 | 13*c* | 41·5 | 26 | 0 | 0 |
| V. | | Weymouth (Langton Herring) | 2·90 | ... | 1·02 | 28 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·69 | — 1·03 | ·55 | 28 | 8 | 82·0 | 28 | 40·0 | 1 | 0 | ... |
| ,, | | Bodmin | 1·18 | — 2·03 | ·26 | 6 | 14 | 73·0 | 26*d* | 43·0 | 7,10 | 0 | 0 |
| VI. | | Cirencester | 3·29 | + ·80 | 1·30 | 28 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton (Woolstaston) | 3·02 | + ·15 | 1·04 | 28 | 9 | 78·0 | 28 | 42·0 | 10 | 0 | 0 |
| ,, | | Tenbury (Orleton) | 2·82 | + ·08 | 1·55 | 28 | 9 | 82·0 | 13 | 32·5 | 1 | 0 | 1 |
| VII. | | Leicester | 1·86 | ... | ·57 | 6 | 12 | 83·0 | 28 | 33·6 | 1 | 0 | 1 |
| ,, | | Boston | ·46 | — 1·79 | ·18 | 8 | 7 | 81·0 | 13 | 42·0 | 17 | 0 | ... |
| ,, | | Grimsby (Killingholme) | 1·02 | — 1·35 | ·31 | 6 | 9 | 78·0 | 13 | 39·0 | 1 | 0 | ... |
| ,, | | Hesley Hall [Tickhill] | ·68 | ... | ·39 | 8 | 7 | 84·0 | 27 | 34·0 | 1 | 0 | ... |
| VIII. | | Manchester (Ardwick) | ·88 | — 2·28 | ·27 | 8 | 7 | 82·0 | 28 | 45·0 | 1 | 0 | 0 |
| IX. | | Wetherby (Ribston Hall) | ·66 | — 2·21 | ·29 | 8 | 4 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | ·61 | — 3·21 | ·18 | 8 | 12 | 85·0 | 28 | 37·0 | 3 | 0 | ... |
| X. | | North Shields | 1·35 | — ·68 | ·47 | 8 | 8 | 79·0 | 13 | 38·0 | 1 | 0 | 0 |
| ,, | | Borrowdale (Seathwaite) | 1·47 | — 6·34 | ·44 | 24 | 10 | 81·0 | 28 | 39·0 | 4 | 0 | ... |
| XI. | WALES. | Cardiff (Ely) | 2·28 | — ·78 | 1·60 | 28 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest | ·43 | — 2·60 | ·12 | 1,28 | 7 | 80·0 | 27 | 35·0 | 9 | 0 | 1 |
| ,, | | Plinlimmon (Cwmsymlog) | 2·07 | ... | ·80 | 28 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 1·18 | — ·82 | ·69 | 28 | 6 | 81·0 | 28 | 41·5 | 10 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] | ·46 | — 2·71 | ·11 | 29 | 10 | 82·6 | 28 | 38·0 | 14 | 0 | ... |
| ,, | | Hawick (Wilton Hill) | ·44 | ... | ·19 | 5 | 6 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | ·69 | — 2·32 | ·23 | 29 | 5 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory) | 1·35 | — 2·49 | ·45 | 1 | 9 | 85·0 | 28 | 35·0 | 8,9 | 0 | ... |
| ,, | | Oban (Craigvarren) | 1·81 | ... | ·48 | 1 | 17 | 78·0 | 28 | 38·0 | 13 | 0 | ... |
| ,, | | Mull (Quinish) | 1·21 | ... | ·40 | 1 | 11 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices | ·30 | — 2·47 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath | ·37 | — 2·24 | ·12 | 16 | 10 | 68·0 | 12*f* | 41·0 | 6 | 0 | ... |
| XVII. | | Braemar | ·80 | — 2·29 | ·16 | 1 | 15 | 80·7 | 28 | 52·0 | 9 | 2 | 5 |
| ,, | | Aberdeen | ·98 | ... | ·36 | 22 | 12 | 73·0 | 28 | 38·0 | 5 | 0 | 0 |
| XVIII | | Skye (Sligachan) | 4·63 | ... | 1·50 | 2 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden | ·97 | — 1·28 | ·30 | 23 | 6 | 75·0 | 29 | 37·0 | 6 | 0 | 2 |
| XIX. | | Dunrobin | ·80 | ... | ·25 | 21 | 8 | 68·5 | 29 | 39·5 | 5 | 0 | ... |
| ,, | | Orkney (Sandwick) | 1·59 | — ·21 | ·34 | 12 | 16 | 65·0 | 30 | 41·7 | 5 | 0 | 1 |
| XX. | IRELAND. | Cork (Blackrock) | ·70 | — 2·85 | ·14 | 28 | 7 | 84·0 | 24 | 43·0 | 8 | 0 | 0 |
| ,, | | Dromore Castle | 1·56 | ... | ·45 | 10 | 7 | 72·0 | 23 | 40·0 | 19 | 0 | ... |
| ,, | | Waterford (Brook Lodge) | ·56 | ... | ·17 | 3 | 6 | 76·0 | 21 | 37·0 | 1 | 0 | 2 |
| ,, | | Killaloe | ·35 | ... | ·12 | 1 | 6 | 81·0 | 14 | 42·0 | 2 | 0 | ... |
| XXI. | | Portarlington | ·54 | — 1·89 | ·21 | 1 | 9 | 77·0 | 27 | 41·0 | 13 | 0 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·25 | — ·95 | ·55 | 3 | 10 | 75·4 | 13 | 43·1 | 1 | 0 | 0 |
| XXII. | | Ballinasloe | ·63 | — 2·56 | ·17 | 1 | 11 | 72·0 | 27 | 38·0 | 14 | 0 | 0 |
| XXIII | | Waringstown | ·84 | — 1·82 | ·24 | 7 | 8 | 85·0 | 27 | 33·0 | 9 | 0 | 0 |
| ,, | | Londonderry (Creggan Res.) | 1·45 | ... | ·32 | 1 | 13 | ... | ... | ... | ... | ... | ... |
| | | Omagh (Edenfel) | 1·35 | — 1·70 | ·32 | 29 | 17 | 78·0 | 28 | 42·0 | 1*g* | 0 | 0 |

+ Shows that the fall was above the average; — that it was below it.

28. *b* And 17. *c* And 26, 28. *d* And 27. *f* And 13. *g* And 6, 9, 13.

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# METEOROLOGICAL NOTES ON JUNE.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The continuance of fine weather enabled farmers to make their hay in excellent order; wheat promises to be better than for many years past; barley and peas look well; roots need rain. T on 4th, TS on 5th; first wheat ears on 8th; hay cut on 9th.

BANBURY.—T and L on 6th; T on 7th and 8th; T, L, and heavy R on 28th.

CULFORD.—A very hot, dry, month; hay crops very poor; everything suffering from want of rain.

LANGTON HERRING.—A very fine month; with temp. slightly above the average; distant T was heard on the 7th and 11th, and on some other days, and a rather violent TS occurred on the evening of 28th, 1·02 in. of R falling between 9 p.m. on that day and 2 a.m. on 29th. From 12th to 22nd, the weather was perfect for haymaking, but the crop is light.

ORLETON.—The temp. was low on the first nine days, with much cloud, frequent falls of R, and distant TSS; the weather then became unusually bright and dry, with a prevailing N. wind and cold nights. On the 28th the temp. rose to 81°·7, followed after midnight by distant T, and an immense fall of R 1·73 in. in less than 20 hours, which apparently did not extend far to the E.; the drought before this had very seriously affected all vegetation, except the wheat crop. The mean temp. of the month was about a quarter of a degree above the average of 23 years. Distant T on six days.

LEICESTER.—From 8th to 28th very little R fell, and both fields and gardens were much in need of moisture, but a refreshing R occurred on 29th.

BOSTON.—Rainfall of the month the smallest recorded in June since 1868, in which year the fall during the three months, May, June, and July, was only 1·25 in. Wheat in ear on 10th.

KILLINGHOLME.—A very dry month, great inconvenience caused by want of water for all purposes.

ARDWICK.—A very dry fine month, but the night temp. was rather low, which, with the drought, was injurious to vegetation; the health of the city was threatened by the want of R to flush the sewers, and in some parts of Lancashire, owing to the want of water, several works had to be partially or entirely closed; refreshing showers fell at the end of the month. Hay and straw short.

ARNCLIFFE.—Hay crop light, owing to want of R, and pastures much dried up.

## WALES.

HAVERFORDWEST.—Temp. about the average, it rose to 70° twice in the first 17 days, but with these exceptions was low day and night, particularly up to the 10th, before which date it rarely reached 60°; the 9th was remarkably cold, the min. on grass being as low as 27°·5; after the 18th the temp. increased considerably, but from the 27th to the end of the month, the weather was unsettled, and in some places much R fell, accompanied by T and L. Rainfall the smallest since 1859, the year of the memorable drought, when ·30 in. fell. Hay crop very light; wheat looks well on good land; public health remarkably good, and death rate very low.

LLANDUDNO.—A month of fine dry and sunny weather, but the mean temp. was about 2° below the average; more than two-thirds of the R fell on the 28th and 29th, a TS occurring on the first-mentioned day. The winds were light and variable; duration of bright sunshine 202 hours. Hay crop very light, and pastures suffered much from drought.

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## SCOTLAND.

CARGEN.—Light and variable winds prevailed during most of the month; the mean temp. was 0°·7, and the duration of sunshine 15 hours below the average; from May 17th to June 30th only ·50 in of R fell, and the crops generally suffered from drought.

CRAIGVARREN.—One of the finest and most genial months experienced for many years; it produced a golden hay crop, and left vegetation in a most luxuriant state, on 30th an unusually heavy white mist prevailed for 20 hours over the sea, stopping all steamboat traffic.

ABERDEEN.—The month on the whole was fine, the first six days were fair followed by a week of showery weather, and it was again showery from 21st to 26th; the remainder of the month was fine, though not always bright.

CULLODEN.—The weather was very dry all through the month, little R fell and that at long intervals, doing no good to pastures or grain crops, which at the close were suffering considerably.

SANDWICK.—The rainfall was irregular, heavy falls occurring in some districts, while others were parched; the temp. was low during the first part of the month, owing to northerly winds, but it became warm during the latter part, the temp. in shade rising to 65°, and in sun to 110°. There was a strong breeze of about 40 miles an hour on the morning of the 25th.

## IRELAND.

CORK.—Dry weather prevailed during the greater part of the month, with a high and steady bar; from May 13th to June 21st R fell on only nine days, the amount scarcely exceeding ·50 in.; no TS8.

DROMORE CASTLE.—Fine weather with heavy dews at night; all crops very promising.

WATERFORD.—Rainfall 2·69 in. below the average of 10 years, and number of wet days 10 below the average. T on 13th and 29th; thick fog on 12th. The country is very parched, and the crops very backward.

KILLALOE.—The loveliest June in a record of 39 years; max. temp. in shade 79° to 80° on several days. Only twice during the past 39 years was the rainfall of June less than one inch, viz., 1849, ·73 in.; 1870, ·71 in.

DUBLIN.—The month as a whole was very fine, dry, and warm, though it was cold and showery at the beginning; mean temp. very near to the average of 20 years. Rainfall the smallest in any June since 1877, when only ·92 in. fell, and number of wet days also small. L on 3rd and 28th; distant T on 30th. Prevailing direction of wind N.W.; mean humidity 74; mean amount of cloud 6·7.

BALLINASLOE.—The driest month during 12 years, warm and pleasant.

WARINGSTOWN.—A very dry month, and the last week intensely hot.

EDENFEL, OMAGH.—The month afforded the longest continuance of summer weather that has been experienced for many years.

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UNIV. OF CALIFORNIA

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXIII.] AUGUST, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE THUNDERSTORMS OF JULY, 1884.

As intimated in our last, we now present a first instalment of the list of damages by the thunderstorms of last month. We know that it is very imperfect, as very few of our correspondents seem to have noticed the editorial plea for information appended to the interesting letter by the Rev. W. Clement Ley. Still the list is terribly heavy, and when we arrive at the close, and try to sum up the actual pecuniary loss (irrespective of course of the many human lives to which no price could be attached), we think that its amount will be larger than most persons would imagine.

Much of the information rests upon the authority of country newspapers; it may therefore be well to state that nearly thirty years since we devoted three years to forming similar tables, *but* we sent every paragraph to the clergyman or other responsible person in each parish, so that any stretching or misstatement might be detected. We have not done so now for two reasons (1) because not one per cent. of the paragraphs in 1857-59 proved to be the least exaggerated, and (2) because the experience then gained shows that the errors are not serious enough to be worth the time necessary to hunt them out.

We reserve all comments until the list be finished, and in the meanwhile shall be glad of additional facts.

### FRIDAY, JULY 4th.

#### BERKSHIRE.

*Aston, Wallingford.*—C. Bearley and T. Streakes were killed while at work in a field; their clothes were completely burned. A horse was killed in the neighbourhood.

#### BUCKINGHAMSHIRE.

*Addington, Winslow.*—Very sharp TS at 1.30 p.m., some trees struck.

*Olney.*—Tree struck.

#### OXFORDSHIRE.

*Banbury.*—Several trees struck; at Town's End four or five standing together were destroyed.



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*Deddington.*—W. H. Smith was sheltering under a tree, and just going to eat the dinner which his wife had brought him, when he was killed, though his wife sustained no serious injury.

*Magdalen Coll. Oxford.*—T and R.

*Oxhill.*—Messrs. Parker had a cow killed.

*South Newington, Deddington.*—Mr. Tustain had a cow killed.

*Upton, Burford.*—Mr. Berridge had a horse killed.

## NORTHAMPTONSHIRE.

*Althorp House, Northampton.*—Three horses killed.

*Benefield, Oundle.*—Several sheep killed.

*Braybrook, Rothwell.*—Cattle killed.

*Brigstock, Thrapstone.*—Mr. Ashwell had two sheep killed.

*Chacombe, Banbury.*—A tree struck at the Priory, and a sheep belonging to Mr. Hirons killed.

*Cold Ashby, Daventry.*—A cottage struck and bedstead scorched, though the child in it was uninjured.

*Cottesbrook, Rothwell.*—A horse while drawing a grocer's cart from this village to *Creaton* was struck dead. Nothing is reported respecting the driver.

*Delapré Park, Northampton.*—Five valuable horses belonging to Mr. J. A. S. Bouverie were sheltering under a tree; although little damage was done to the tree, four of the horses were killed, and the fifth was injured.

*Drayton*, near *Daventry.*—Three sheep belonging to Mr. Wearing were killed.

*Easton Neston, Towcester.*—Very severe storm, the most so since August 13th, 1866. Tree struck.

*Farndon, Market Harboro'.*—Public house struck.

*Gayton, Towcester.*—Messrs. Lovell's house struck.

*Guilsborough, Daventry.*—Part of a chimney knocked off a cottage.

*Hemington, Oundle.*—Trees struck.

*Hulcote, Towcester.*—A horse belonging to Mr. Jennaway killed while grazing.

*Little Bowden, Market Harborough.*—A bullock killed.

*Lower Boddington, Banbury.*—A cow belenging to Mr. Andrews killed.

*Northampton.*—Chimney of 76, Hunter-street, struck; the lightning appeared to pass down a metal bedstead, and then to ignite the skirting-board against which it stood. Chimney of factory in St. Edmund's-road damaged, also (slightly) the roof of the barracks, and several dwelling-houses and trees struck.

*Oundle.*—Heavy TS, and ·33 in. of R in 45 minutes.

*Peterborough.*—Many sheep and cattle killed in this neighbourhood.

*Raunds, Higham Ferrers.*—A tree struck at Mr. Askham's, a groove being ploughed out from one of the branches to the earth. Several men were sheltering beside a loaded waggon of hay, to which four horses were attached, all the horses were struck down, two being

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killed, and of the others one had to be slaughtered; the men were very slightly injured.

*Staverton, Daventry.*—A valuable cow was killed, and an elm at Catesby House injured. A strong sulphurous odour was very perceptible during the storm.

*West Haddon, Daventry.*—TS passed from S to N, between 2.30 and 3.30 p.m.

*Wollaston, Wellinboro.*—A malting in Long-street was struck about 3 p.m., ignited, and entirely destroyed.

HUNTINGDON.

*Ramsey.*—A tree shivered at Park Farm, and a cow killed. A hay-stack near Puttock Bridge ignited and destroyed.

*Sawtry, Whittlesea.*—Four beasts killed here, and a number of cattle and sheep killed in other places.

BEDFORDSHIRE.

*Turvey, Bedford.*—At 3 p.m. an ash-tree in the hedge between Mr. Paine's and Mr. Whitworth's meadows was completely stripped and set fire to. It continued burning until the Monday.—[Even if we assume that it ceased to burn at midnight on Sunday, it still leaves 33 hours for it to have continued alight.—ED.]

CAMBRIDGE.

*Conington, Caxton.*—A large oak tree splintered.

*Stonea, near March.*—Eighteen sheep belonging to Mr. Morton killed.

*Whittlesea.*—Ricks set on fire.

STAFFORDSHIRE.

*Heath House, Cheadle.*—TS.

WARWICKSHIRE.

*Bilton, Rugby.*—Some posts and rails in a field split, two beasts belonging to Mr. Fuller killed. and the top struck off a tree opposite the post office.

*Birdingbury.*—Two very valuable heifers belonging to Mr. Lucas were killed.

*Coombe Abbey.*—Struck, and slightly injured.

*Harington.*—Some trees splintered.

*Hillmorton, Rugby.*—Mr. Rathbone had two beasts killed, and on Mr. Rodgers' land a tree was struck.

*Hill, Leamington Hastings, Southam.*—Mr. Gilks lost a valuable sheep, and an elm tree was shivered.

*Rugby.*—Two trees struck, one in Dale Street and the other in Hillmorton Road,

*Wolston, Coventry.*—Eleven sheep belonging to Mrs. Parsons were killed under a tree; a cow belonging to Mr. Eales was struck dead in the open field, and an elm at the vicarage struck.

LEICESTERSHIRE.

*Ashby Parva.*—A cow belonging to the Rev. W. C. Ley was

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stunned, but eventually recovered, and an elm tree near to the shed in which the cow was, was also stripped of some of its branches and bark. A large ash tree on the road from Ashby to Gilmorton was nearly destroyed.

*Burton Lazars, Melton.*—Mr. Benskin was on the top of a hay-rick, the storm becoming heavy he descended, and within three minutes a flash struck the rick, split a fork which had been left upon it, and also the ladder standing against it, and ignited the rick. [Another account comes from the same village, but gives the farmer's name as Sapcote; doubtless both refer to one event.—ED.]

*Cold Overton, Melton.*—Mr. Eaton had just alighted from his trap, taken out the horse, and left the trap, when it was struck, the iron of the splash-board and of the seat bent, and the trap sent away several yards.

*East Norton, Leicester.*—Several animals killed.

*Long Whatton, Loughborough.*—Mr. Wilkins had a very valuable horse killed.

*Loughborough.*—TS from 2.45 to 3.40 p.m. Black Horse Hotel struck, out-buildings damaged, and a clock stopped at 3.3 p.m. A boy named Arthur Orton was struck in The Pastures, but recovered consciousness within an hour. A chimney-stack was struck at Park-lane.

*Lubenham, Market Harboro'.*—A sheep killed, a chimney demolished, and an ash tree split from top to bottom.

*Melton.*—A chimney was struck in King-street; the owner of the house, Mr. Southgate, was sitting in the room conversing with a friend; the latter says that hearing a noise in the chimney he turned to see the cause, and saw a ball of fire in the grate. The ball immediately exploded, and the lightning passed between himself and Mr. Southgate on its course out of the room through the open window.

*Scalford, Melton.*—Mr. Kirk had a ewe and a lamb killed; and Mr. Wright lost a sheep.

*Shangton, Leicester.*—Some bullocks killed.

*Sheepshead, Loughborough.*—Mr. Cook's house struck; he temporarily stunned; the general damage was not serious, but "several tins were pierced as with a red hot iron."

*Sileby, Leicester.*—Mr. Dakin had a cow killed.

*Somerby, Melton.*—Mr. Gilford had five sheep killed, and a tree in the village was stripped of its bark, and the earth round its roots scattered.

*Stonton Wyville, Market Harboro'.*—Mrs. Garratt had a bullock killed.

*Whitwick, Ashby-de-la-Zouch.*—Mr. Green's house was struck in the evening, and two cows were killed.

*Willoughby, Lutterworth.*—A ball of fire was observed to strike a stack of clover, to divide it to the centre, and to set it on fire.

*Wymeswold, Loughborough.*—T. Hubbard and his uncles, J. and W. Tuckwood, were mowing rye grass, the storm being heavy, and there

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being no trees they got close to a hedge, and covered themselves with some of the rye grass, while in this position they were all struck, and two out of the three killed instantly, the other recovered. There were no marks on the deceased, except that their faces were very blue.

RUTLAND.

*Uppingham.*—A gasometer was overthrown during the storm, but whether it was struck by lightning is unknown.

LANCASHIRE.

*Barrowford, Burnley.*—A horse was killed while grazing in a field, and two men who were near were struck, but not fatally.

*Breeze Hill, Liverpool.*—T.

*Burrow, Hornby.*—Mr. Capstick had two sheep killed.

*Nelson, Burnley.*—Two men seriously injured. [Probably another report of the Barrowford accident.—ED.]

*Whittington, Hornby.*—An ash tree split.

YORKSHIRE.

*Crosshills.*—A cartload of hay struck and ignited.

*Ingleton.*—Mr. J. Towers had six sheep killed.

*Scarborough.*—TS.

*Skipton.*—A tree shivered in the churchyard.

*Slatenber, Ingleton.*—A building belonging to Mr. Hezeltine was struck, and considerably damaged.

DURHAM.

*Whorlton, Darlington.*—Hot, with TS, and ·25 in. of R between 6 and 7 p.m.

NORTHUMBERLAND.

*Unthank Hall, Haltwhistle.*—A very severe TS with vivid and nearly continuous L; a cow killed under a tree near the hall. In four hours 2·01 in. of R fell here and on the hills; it must have been very heavy, for the burns were swelled beyond all experience, and came down in such volume and with such violence that bridges, watergates, large stone gateposts, &c., were carried away.

## SCOTLAND.

DUMFRIESSHIRE.

*Lockerbie.*—The chimney of Miss Foster's house in Arthur's-place was demolished, and the roof damaged.

EDINBURGHSHIRE.

*Leith.*—The top flat of No. 24, Glover-street was entered by the lightning, the bell wires melted, and other damage done. A young man in bed, though much frightened at the ruin in his room, was quite unhurt.

FIFESHIRE.

*Kirkcaldy.*—Much damage was done in the town and suburbs. Miss Ramsay's house in Gallatown was struck, and the gas-pipes

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exploded. At the Gallatown Maltings a ventilator was struck, and one of the beams shattered. At Sinclairtown Mr. Reid's house was struck, the woodwork set on fire, and various articles destroyed; a hay-rick was also struck and consumed.

PERTHSHIRE.

*Avintully.*—A thatched house was struck, set on fire, and partly burned; the inmates were rescued.

TSS were also reported from *Hawick, Roxburgh, Cassilis,* AYR, *Stronvar,* PERTH, *Cawdor* and *Glenfinnan,* INVERNESS, and *Miltown Malbay,* CLARE.

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## SATURDAY, JULY 5th.

KENT.

*Goodnestone, Wingham.*—The stables of Sir Brook Bridges were struck and ignited, and three valuable horses burned.

*Sarr, Ramsgate.*—The house occupied by Mr. Rogers was struck, and considerably damaged.

CAMBRIDGESHIRE.

*Cambridge.*—During the height of the storm a fire occurred about 3 a.m., at a shop in Sussex-street, which was believed to have been caused by lightning.

*Kingston, Caxton.*—A woman died suddenly during the storm, but it was probably due to fright.

ESSEX.

*Colchester.*—A house struck, and several persons slightly injured.

SUFFOLK.

*Boxford.*—Several trees struck, and insulators on telegraph poles broken.

*Culford, Bury St. Edmunds.*—T.

*Rendlesham Hall, Woodbridge.*—TSS.

NORFOLK.

*Diss.*—TS early.

*Watton.*—The telegraph instrument at the post office damaged.

DORSETSHIRE.

*Stowell Rectory, Sherborne.*—TSS.

LANCASHIRE.

*Breeze Hill, Liverpool.*—T L.

YORKSHIRE.

*Spennymore.*—A house was struck at night, the chimney being shattered, and J. Watson, who was within, was temporarily paralysed.

DURHAM.

*Burnhope, Lanchester.*—A house struck, and partly demolished, but the inmates escaped.

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*Consett.*—During the storm in the afternoon, the house of a miner named T. Gill was struck and much damaged. Gill, who was nursing a child, was killed, but the child escaped.*

*Lane Head, Weardale.*—Two men were at work on the spire of the Wesleyan Chapel, when it was struck, and they were knocked down insensible, but they eventually recovered.

*Whorlton, Darlington.*—TS.

NORTHUMBERLAND.

*Newcastle.*—Several animals killed in this neighbourhood.

## SCOTLAND.

INVERNESS.

*Fort William.*—L. McDonnell was killed while driving some cattle across a field; another young man had a narrow escape, as he saw the lightning strike the earth beside him.

*Uig, Skye.*—Two cows killed, and the telegraphic communication interrupted.

TS at *Hawick*, ROXBURGH; *Stronvar* and *Dalnaspidal*, PERTH; and *Kilkishen*, CLARE.

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## SUNDAY, JULY 6th.

MIDDLESEX.

*Pinner.*—TS.

SURREY.

*Wallington.*—Distant T at 4 p.m.

HEREFORDSHIRE.

*Ross.*—TSS from 4 to 5 a.m., and in E. from 2.15 to 4.15 p.m.

STAFFORDSHIRE.

*Heath House, Cheadle.*—T.

LEICESTERSHIRE.

*Loughborough.*—Slight TS in afternoon.

*Woodhouse, Mount Sorrel.*—Two calves, belonging to Mr. Holt, killed in a field.

LANCASHIRE.

*Breeze Hill, Liverpool.*—TS.

*Everton, Liverpool.*—During a storm in the morning, lightning passed through the roof of Holy Trinity Church, filling the building with a pale blue flame. The current passed between two boys, paralyzing the arm of one and scorching the boot of the other. A panic ensued; most of the congregation rushed out, and the service was abruptly closed. The bell was rendered useless, and coping-stones weighing several hundredweights were hurled some distance. A child lying ill in bed at Everton was struck by the lightning and killed.

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* Once reported as having happened on Sunday, 6th.

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YORKSHIRE.

*Northallerton.*—Many cattle killed, and the railway works much damaged.

*Rawcliffe, Goole.*—Lightning struck one end of a clover stack, passed completely through it, and entered the ground; shortly afterwards smoke was seen to arise, and the stack was found to be on fire.

DURHAM.

*Whorlton.*—Heavy TS, and 2·01 in. of R between 0 and 1 p.m.

## SCOTLAND.

DUMFRIESSHIRE.

*Lockerbie.*—Sixteen sheep were leaving a field in single file, when the foremost was struck, the lightning ran along the line and killed the whole of them.

ELGIN.

*Forres.*—Heavy TS.

INVERNESS.

*Cawdor.*—T.

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### TUESDAY, JULY 8th.

SUSSEX.

*Littlehampton.*—T.

HANTS.

*Redlands, Emsworth.*—TS at 2 a.m.

NORTHAMPTON.

*Oundle.*—T.

WILTS.

*Pewsey.*—T.

STAFFORD.

*Heath House, Cheadle.*—TS.

LANCASHIRE.

*Breeze Hill, Liverpool.*—T L.

YORKSHIRE.

*Scarborough.*—TS.

WESTMORELAND.

*Shap.*—TS at 9.30 p.m.

## SCOTLAND.

ROXBURGH.

*Hawick.*—T.

FIFE.

*Newton Bank, St. Andrew's.*—TS and ·35 in. of R in 25 minutes.

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# ON THE FORMATION OF AIR BUBBLES IN WATER BY DROPS OF RAIN.

By CHARLES TOMLINSON, F.R.S.

BEING caught in a very heavy shower of rain, I sought refuge under an archway, and soon saw the roadway flooded, and a small torrent hurrying along the gutter. But what most arrested my attention was a number of large, well-formed bubbles of air bursting on the surface. I watched these with considerable curiosity, and called to mind some of the accounts given in books on physics as to the cause of the formation of similar bubbles. Thus, when a bullet is fired, or allowed to fall into water, the air is said to be dragged down by the bullet. Others affirm that it is the air adhering to the bullet that forms the bubble, or the adhesion of air to the solid.

I mentioned the phenomenom to one of my scientific colleagues at King's College, and he at once gave the adhesion theory, and remarked that a globule of mercury let fall into water did not form a bubble.

The earliest notice that I have met with of the phenomenon in question, is that by the celebrated Mariotte (who shares with Boyle the discovery of the law of gaseous elasticity) in his *Œuvres*, Leide, 1717, vol. ii., p. 353. He remarks that each drop of rain, in falling from the height of the cloud, drags down two or three times as much air as its own size, as may be shewn by letting a little ball of lead fall into a bucket of water; for as soon as it touches the bottom two or three bubbles of air rise, each as large as itself, which can only proceed from air which follows it to the bottom of the vessel. He compares it to the action of the *Trombe*, in which air is dragged down by falling water.*

It is a mistake to suppose that the air, thus liberated by a body projected into water is adhering air, or air driven in by the projectile, or that the effect is quite the same as the action of the *Trombe*.

In *Poggendorff's Annalen*, vol. xcv. (May, 1855), Professor Magnus refers incidentally to the phenomenon. He says that when a projectile penetrates water, it produces an excavation, of which it forms the bottom, and which closes at the surface before it is complete. The air thus enclosed rises later to the surface. But as the horizontal section of this excavation is always greater than that of the projectile, and increases with its *vis viva*, it follows that the volume of air thus imprisoned may be many times greater than that

* The *Trombe* is an ingenious arrangement for furnishing a wind blast in the Catalan method of smelting iron. A tree is hollowed out, and its lower end inserted into the top of a large wooden chest, while near its upper end a number of apertures, sloping downwards, are cut through the wood. The water of a mountain stream is so led as to pour into the top of the hollow tree, and the descending water exerting no lateral pressure, air rushes in by the slits, as into a vacuum, and accumulating under pressure in the chest, escapes by a blast pipe into the furnace, while an opening near the bottom of the chest, allows the superfluous water to run off.

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of the projectile. It is further remarked that air cannot be introduced into water by a lateral projection of the solid.

In the *Comptes Rendus* for 1867, p. 564, M. Melsens adopts the view of Mariotte, that a leaden ball drags down air. He says that a bullet weighing nearly an ounce, let fall from a height of about forty inches, liberated a volume of air twenty times greater than that of the bullet. Half of the air escaped before the bullet got to the bottom; the other half ascended from the bottom. The length of the column of water is not given.

In the same volume of the *Comptes Rendus*, page 797, is an account of an experiment by M. Laroque, in which he allowed to fall into water a long cylinder of elder pith, to which a small sphere of lead was attached at the lower extremity. The cylinder penetrates the water a certain distance, is then arrested for a moment, and ascends. While falling into the water, a portion of the cylinder remains above its surface; but air-bubbles are formed below the sphere of lead, and are even propelled a little way below it, and ascend less quickly than the cylinder.

According to M. Laroque, the air is pushed forward by the projectile, and he concludes generally that when a projectile is darted into water, air penetrates (1) because it is pushed forward by compression (2) because it is dragged into the depression by the projectile, and the water closes over it; while (3) the volume of air thus imprisoned depends on the density and cohesion of the liquid, and the *vis viva* of the projectile at the moment when it strikes the water.

The phenomenon forms a good lecture-table experiment, if exhibited on a large scale. My mode of showing it is to fill with water a cylindrical glass vessel, 19 inches high, and 3½ inches in diameter, and to suspend some feet above it a glass funnel, so arranged that the axis of the funnel shall be in the same vertical line as the axis of the cylinder. A small leaden or iron bullet, or large shot, put into the funnel, is thus neatly delivered to the water, and as soon as the shot strikes the bottom, several bubbles of air escape, and oscillate up to the surface. By catching the air thus liberated in a graduated inverted test tube, filled with water, the relation between the volume of the solid and that of the liberated air can easily be estimated.

Small marbles may also be used, or inch lengths of thick wire with a similar result. The shot, &c., may be wet, or the lead amalgamated, but the result is the same, so that adhering air is not to be taken into account.

The experiment was also carefully and repeatedly tried with mercury, which formed no exception to the general result, as had been supposed. Indeed seeing how large a bubble can be formed by a drop of rain falling into water, it was not likely that a fluid upwards of thirteen times heavier than water should form an exception.

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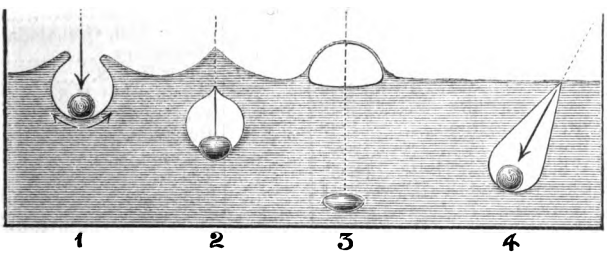
The experiment was also tried with other liquids, such as paraffin oil, spirits of wine, and ether, the volume of air liberated, depending on the height of the fall of the solid body, and the density of the liquid, the volume of air bearing an inverse relation to the density.

The result then, according to my view, may be thus stated :—When a heavy body, such as a bullet, falls upon water, it descends to a certain depth, and leaves above it a cylindrical space, into which air rushes more quickly than the water can fill it up. The shot continuing to fall, constantly clears a space, into which the air as constantly rushes; until the shot being arrested by the bottom of the vessel, the air is detached by the concussion, and forms into bubbles, which ascend.

The dimensions of the vacuous space formed by the bullet depend of course upon its density and *vis viva* or velocity of descent, the greater the fall the larger the space and the larger the volume of air liberated. Thus when a bullet is fired into water from a gun, the *vis viva* is great, and the volume of air liberated is large in proportion. Or when a drop of rain falls from a cloud, it has an enormous *vis viva*, and hence the magnitude of the bubble even in water as shallow as the gutter I was watching while taking shelter from the rain. The process of the formation of the bubble may be




thus graphically represented :—*Firstly.* The rain-drop preserving its integrity as a drop by means of its surface tension, penetrates the water, and leaves an empty space as in *Fig.* 1, into which air rushes before the water can close up the space. *Secondly.* The water closes in, and imprisons the air-bubble, which descends with the rain-drop, as in *Fig.* 2. *Thirdly.* The drop reaches the bottom of the puddle, and the air-bubble is detached, becomes convex by the resistance of the water during its ascent, and reaches the surface as a hemisphere, as in *Fig.* 3, and then bursts.

*Fig.* 4 shews the formation of a bubble when the direction of the rain is oblique.

*Highgate, N., 18th July, 1884.*

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# SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·44 | XI. | Carno, Tybrith ... ..... | 3·75 |
| ,, | Margate, Birchington... | 1·68 | ,, | Corwen, Rhug ..... | ... |
| ,, | Littlehampton ..... | 2·54 | ,, | Port Madoc ..... | 5·22 |
| ,, | Hailsham ..... | 1·90 | ,, | I. of Man, Douglas ..... | 4·36 |
| ,, | I. of W., St. Lawrence. | 2·09 | XII. | Stoneykirk, Ardwell Ho. | 4·20 |
| ,, | Alton, Ashdell..... | 2·37 | ,, | Melrose, Abbey Gate ... | 6·58 |
| III. | Winslow, Addington ... | 2·69 | XIII. | N. Esk Res. [Penicuick] | 5·65 |
| ,, | Oxford, Magdalen Col... | 2·26 | XIV. | Ayr, Cassillis House ... | 4·65 |
| ,, | Northampton ..... | 3·75 | ,, | Glasgow, Queen's Park. | 5·38 |
| ,, | Cambridge, Beech Ho... | 2·44 | XV. | Islay, Gruinart School.. | 2·56 |
| IV. | Southend ..... | 1·96 | XVI. | St. Andrews, Newton Bk | 4·35 |
| ,, | Harlow, Sheering ... .. | 2·04 | ,, | Balquhidder, Stronvar.. | 6·82 |
| ,, | Diss ..... | 1·26 | ,, | Dunkeld, Inver Braan.. | 5·64 |
| ,, | Swaffham ..... | 2·00 | ,, | Dalnaspidal H.R.S. ... | 5·53 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 1·90 |
| V. | Salisbury, Alderbury... | 2·33 | ,, | Forres H.R.S. ..... ... | 1·45 |
| ,, | Warminster ..... | 3·51 | XVIII. | Strome Ferry H.R.S.... | 5·57 |
| ,, | Calne, Compton Bassett | 2·06 | ,, | Lochbroom ..... | 5·13 |
| ,, | Ashburton, Holne Vic.. | 4·93 | ,, | Tain, Springfield..... | 1·93 |
| ,, | Holsworthy, Clawton... | 3·62 | ,, | Loch Shiel, Glenaladale | 6·37 |
| ,, | Lynmouth, Glenthorne. | 2·36 | ,, | Invergarry ..... | 3·84 |
| ,, | Probus, Lamellyn ..... | 3·68 | XIX. | Lairg H.R.S. ..... | 2·51 |
| ,, | Wincanton, Stowell Rec. | 4·43 | ,, | Forsinard H.R.S. ..... | 1·91 |
| ,, | Taunton, Fullands ..... | 2·48 | ,, | Watten H.R.S. ..... | 2·01 |
| VI. | Bristol, Clifton ..... .. | 3·67 | XX. | Dunmanway, Coolkelure | 6·01 |
| ,, | Ross ..... | 3·51 | ,, | Fermoy, Gas Works ... | 1·50 |
| ,, | Wem, Sansaw Hall..... | 2·68 | ,, | Tralee, Castlemorris ... | 3·58 |
| ,, | Cheadle, The Heath Ho. | 3·23 | ,, | Tipperary, Henry Street | 4·36 |
| ,, | Worcester, Diglis Lock | 3·72 | ,, | Newcastle West ..... | 3·36 |
| ,, | Coventry, Coundon ..... | 3·37 | ,, | Miltown Malbay..... | 3·57 |
| VII. | Melton, Coston ..... | 4·92 | ,, | Corofin ..... | 2·85 |
| ,, | Ketton Hall [Stamford] | 3·52 | XXI. | Carlow, Browne's Hill.. | 3·67 |
| ,, | Horncastle, Bucknall ... | 3·50 | ,, | Navan, Balrath ..... | 3·20 |
| ,, | Mansfield, St. John's St. | 3·83 | ,, | Mullingar, Belvedere ... | 3·39 |
| VIII. | Macclesfield, The Park. | 3·83 | ,, | Athlone, Twyford ..... | 2·96 |
| ,, | Walton-on-the-Hill..... | 4·86 | XXII. | Galway, Queen's Col.... | 2·94 |
| ,, | Lancaster, South Road. | 6·63 | ,, | Clifden, Kylemore ..... | 8·12 |
| ,, | Broughton-in-Furness .. | 6·87 | ,, | Crossmolina, Enniscoe.. | 4·44 |
| IX. | Wakefield, Stanley Vic. | 3·11 | ,, | Carrick-on-Shannon ... | 4·24 |
| ,, | Ripon, Mickley ..... | 3·75 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 2·29 | ,, | Rockcorry..... | 2·79 |
| ,, | East Layton [Darlington] | 5·18 | ,, | Warrenpoint ..... | 3·92 |
| ,, | Middleton, Mickleton .. | 5·73 | ,, | Newtownards ..... | 4·22 |
| X. | Haltwhistle, Unthank.. | 9·29 | ,, | Belfast, New Barnsley.. | 4·35 |
| ,, | Shap, Copy Hill ..... | 5·77 | ,, | Cushendun ..... | 4·03 |
| XI. | Llanfrechfa Grange . ... | 3·83 | ,, | Bushmills ..... ..... | 3·06 |
| ,, | Llandovery ..... | 4·22 | ,, | Stewartstown ..... | 3·12 |
| ,, | Lower Solva ..... | 3·06 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 3·90 | ,, | Buncrana ..... | 3·42 |
| ,, | Rhayader, Nantgwillt.. | 4·77 | ,, | Carndonagh ..... | 3·58 |

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# JULY, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max Deg. | Date | Min. Deg | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·46 | — ·01 | ·60 | 9 | 17 | 86·9 | 4 | 42·2 | 26 | 0 | 0 |
| II. | | Maidstone (Hunton Court)... | 1·45 | — ·59 | ·30 | 4 | 15 | ... | ... | ... | ... | ... | ... |
| „ | | Strathfield Turgiss ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| III. | | Hitchin ..... | 3·89 | + 1·19 | 1·75 | 9 | 16 | 80·0 | 4 | 42·0 | 25 | 0 | 0 |
| „ | | Banbury ..... | 2·86 | — ·12 | ·49 | 4 | 23 | 82·0 | 3,4 | 39·0 | 26 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·32 | — ·65 | ·32 | 24*a* | 18 | 87·0 | 3,8 | 42·0 | 25 | 0 | ... |
| „ | | Norwich (Cossey) ..... | 2·17 | — ·58 | ·63 | 21 | 14 | 85·5 | 3 | 44·0 | 20 | 0 | 0 |
| V. | | Weymouth(LangtonHerring) | 2·41 | ... | ·42 | 15 | 17 | ... | ... | ... | ... | ... | ... |
| „ | | Barnstaple..... | 3·12 | — ·43 | ·83 | 23 | 19 | 80·0 | 3 | 49·0 | 1,26 | 0 | 0 |
| „ | | Bodmin ..... | 4·29 | + ·85 | ·58 | 14 | 25 | 73·0 | 20 | 49·0 | 25 | 0 | ... |
| VI. | | Cirencester ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| „ | | ChurchStretton(Woolstaston) | 3·30 | + ·27 | ·51 | 11 | 22 | 75·0 | 8 | 46·0 | 26 | 0 | 0 |
| „ | | Tenbury (Orleton) ..... | 3·21 | + ·30 | ·51 | 13 | 18 | 76·8 | 8 | 40·2 | 26 | 0 | 0 |
| VII. | | Leicester ..... | 3·31 | ... | ·44 | 23 | 22 | 86·0 | 3,4 | 42·2 | 26 | 0 | 0 |
| „ | | Boston ..... | 2·41 | — ·12 | ·40 | 10 | 15 | 84·0 | 4 | 44·0 | 26 | 0 | ... |
| „ | | Grimsby (Killingholme)..... | 2·36 | — ·42 | ·52 | 10 | 20 | 76·0 | 13 | 44·0 | 26 | 0 | ... |
| „ | | Hesley Hall [Tickhill]..... | 2·65 | ... | ·83 | 10 | 19 | 87·0 | 3 | 41·0 | 20 | 0 | ... |
| VIII. | | Manchester (Ardwick)..... | 4·23 | + ·42 | ·66 | 9 | 22 | 79·0 | 3,4 | 47·0 | 26 | 0 | 0 |
| IX. | | Wetherby (Ribston Hall) .. | 4·05 | + 1·44 | 1·16 | 11 | 11 | ... | ... | ... | ... | ... | ... |
| „ | | Skipton (Arncliffe) ..... | 7·75 | + 2·80 | 1·25 | 10 | 27 | 72·0 | 31 | 39·0 | 24 | 0 | ... |
| X. | | North Shields ..... | 2·72 | + ·17 | ·38 | 22 | 19 | 75·0 | 31 | 41·5 | 26 | 0 | 0 |
| „ | | Borrowdale (Seathwaite)..... | 10·01 | + 1·24 | 2·37 | 15 | 25 | 81·9 | 3 | 41·5 | 20 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 5·12 | + 1·31 | 1·23 | 26 | 22 | ... | ... | ... | ... | ... | ... |
| „ | | Haverfordwest ..... | 4·97 | + 1·04 | 1·57 | 7 | 19 | 75·3 | 3 | 43·0 | 1 | 0 | 0 |
| „ | | Plinlimmon (Cwmsymlog) ... | 5·04 | ... | ·87 | 28 | 21 | ... | ... | ... | ... | ... | ... |
| „ | | Llandudno..... | 4·48 | + 1·77 | ·91 | 5 | 20 | 72·0 | 5 | 42·8 | 21 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 5·67 | + 2·54 | ·91 | 9 | 22 | 78·8 | 4 | 41·0 | 20*a* | 0 | 0 |
| „ | | Hawick (Wilton Hill)..... | 5·49 | ... | 1·21 | 5 | 20 | ... | ... | ... | .. | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 4·95 | + 1·66 | 1·58 | 10 | 17 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·26 | + ·72 | 1·73 | 10 | 23 | ... | ... | ... | ... | ... | ... |
| „ | | Oban (Craigvarren) ..... | 6·57 | ... | 2·41 | 10 | 22 | 75·0 | 5 | 44·0 | 20 | 20 | ... |
| „ | | Mull (Quinish)..... | 4·83 | ... | 1·32 | 10 | 22 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 5·30 | + 2·25 | 1·10 | 11 | 13 | ... | ... | ... | ... | ... | ... |
| „ | | Arbroath ..... | 4·89 | + 2·25 | 1·20 | 11 | 22 | 68·0 | 17 | 43·0 | 20 | 0 | ... |
| XVII. | | Braemar ..... | 4·93 | + 2·07 | 1·56 | 10 | 26 | 75·3 | 4 | 39·0 | 20 | 0 | 0 |
| „ | | Aberdeen ..... | 2·93 | ... | ·65 | 15 | 18 | 70·0 | 13 | 39·0 | 26 | 0 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| „ | | Culloden ..... | 3·86 | + 1·08 | ·81 | 7 | 15 | 75·0 | 9 | 41·0 | 20*c* | 0 | 0 |
| XIX. | | Dunrobin ..... | 2·04 | ... | ·45 | 23 | 16 | 69·5 | 8 | 38·5 | 20 | 0 | ... |
| „ | | Orkney (Sandwick)..... | 2·54 | — ·12 | ·69 | 13 | 15 | 68·8 | 10 | 41·3 | 22 | 0 | 2 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 2·64 | — ·20 | ·49 | 9 | 17 | 84·0 | 2 | 44·0 | 7 | 0 | ... |
| „ | | Dromore Castle ..... | 6·28 | ... | ·90 | 6,9 | 22 | 67·0 | 31 | 47·0 | 4 | 0 | ... |
| „ | | Waterford (Brook Lodge) ... | 2·19 | ... | ·31 | 11 | 19 | 75·0 | 29 | 44·0 | 19 | 0 | 0 |
| XXI. | | Killaloe ..... | 4·33 | ... | ·48 | 6 | 17 | 75·0 | 2 | 45·0 | 19 | 0 | ... |
| „ | | Portarlington ..... | 2·51 | — ·17 | ·48 | 22 | 23 | 75·0 | 2 | 45·0 | 18 | 0 | 0 |
| XXII. | | Dublin (FitzWilliam Square) | 2·35 | — ·07 | ·42 | 22 | 25 | 70·7 | 5, 30 | 47·1 | 17 | 0 | 0 |
| XXIII | | Ballinasloe ..... | 2·69 | — ·19 | ·48 | 27 | 21 | 70·0 | 5 | 40·0 | 19 | 0 | .. |
| „ | | Waringstown ..... | 3·19 | — ·39 | ·57 | 28 | 22 | 80·0 | 4 | 44·0 | 19 | 0 | 0 |
| „ | | Londonderry (Creggan Res.). | 2·84 | ... | ·35 | 28 | 24 | ... | ... | ... | ... | ... | ... |
| „ | | Omagh (Edenfel) ..... | 3·46 | + ·21 | ·83 | 28 | 21 | 76·0 | 3 | 44·0 | 18 | 0 | 0 |

+ Shows that the fall was above the average; — that it was below it.

*a* And 28. *b* And 9, 26. *c* And 27, 29.

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# METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

[For details respecting the thunderstorms, see separate article.]

## ENGLAND.

BANBURY.—The weather of the month was very unfavourable for getting hay, but was useful to grain crops, although they were considerably beaten down by the R. At the close of the month much hay was still out, some grass remained uncut, and the corn harvest had not commenced. T on 5 days.

CULFORD.—The ground at the beginning of the month was very dry, and although showers were general and frequent throughout, the quantity of moisture was not sufficient for dry soils. Harvest progressing favourably.

WOOLSTASTON.—A wet month; the hay harvest secured with much difficulty. Mean temp., 60°·0.

ORLETON.—The weather during the month was very showery, and there was rarely a day without a few spots of R; T was heard on 6 days, and L was seen on 2 days; on the 13th there was a great fall of R for a few minutes. The temp. was equable, and about 0°·5 below the average of 23 years; the bar. was generally steady. The crop of hay was very light, and much of the late secured was damaged by R.

LEICESTER.—The month was a very unsettled one, and T and L were frequent; on the 8th, between 4.15 p.m. and 4.45 p.m., the wind changed from E. to S.W., then to N.E., and then to S.W.

MANCHESTER.—June having been very dry, rain was much required at the beginning of this month, but on the 3rd day the dry weather ceased and welcome R began, and fell more or less for nearly 20 consecutive days, restoring vegetation, and replenishing to a large extent the supply of potable water, which had got dangerously low, besides flushing the sewers, and thereby improving the health of the town. The night temperatures were rather low; only two TS occurred of any note.

KILLINGHOLME.—A real summer month; frequent T and L and many showers, but none heavy; more R wanted on heavy lands. Corn likely to be good in quality.

ARNCLIFFE.—During a violent TS on 3rd, ·65 in. of R fell in 45 minutes, a larger quantity than had fallen during the 48 days previous.

NORTH SHIELDS.—T on 6 days.

## WALES.

HAVERFORDWEST.—The month was fine and warm, with high day and night temp. up to the 15th; after St. Swithin's Day (which was very wet and stormy) the weather continued broken and wet for several days, and did not recover its fine summer character until the 29th, from which date to the 31st the temp. steadily increased, and the air was very dry. The temp. rose to or above 70° on 12 days, and the R fell mostly at night. As a whole, it was certainly the finest July since 1880. Prevailing winds, Southerly, N. and N.W. On the 27th, at 11 p.m, a bright, but small meteor was seen in the S.E., at an angle of 45° above the horizon. Wheat and oats look very well, but barley is thin on most grounds; the frequent R during the greater part of the month did wonders for the green crops.

LLANDUDNO.—The temp. of the month, although equable, was slightly below the average, and the range, both diurnal and monthly, considerably less than usual. R fell on 20 days, the average being about 11 days, and the total fall was large; the pastures, gardens, and green crops, which had suffered much from the drought of the previous month, were of course much benefited by this excess of R, which falling mostly in showers, did not interfere materially with out-door exercise. Duration of bright sunshine, 137 hours.

## SCOTLAND.

CARGEN.—A very unusual number of TS occurred during the first half of

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of the month; mean temp. (59°·2) about the average; duration of sunshine 40 hours below the average. T on 10 days.

HAWICK.—A fine growing month; T on 6 days.

OBAN.—A glorious month, with sufficient R to encourage vegetation, which with ample sunlight has made excellent progress. In the latter half of the month the temp. fell considerably. T and L on 3rd, 4th, 9th and 10th. On 10th, 2·41 in. of R fell in 7 hours; new rifts were opened in the hill sides, and a large amount of debris carried down.

ABERDEEN.—During the first week of the month foggy weather was experienced, and the prevailings winds during the first fortnight were south-easterly. Rainfall somewhat above the average.

CULLODEN.—The R of the month fell generally with T8S, chiefly between the 7th and 25th, and in consequence the hay crop was more or less damaged, but other crops benefited; the weather during the last week was particularly fine and dry.

SANDWICK.—A pleasant month; the rainfall was just about the average and the temp. was about the mean of the previous 57 years. The most remarkable feature of the month was the fog which prevailed more or less every day from 2nd to 9th, inclusive.

## IRELAND.

CORK.—The weather about the beginning and in the middle of the month was dry, but frequent slight showers, generally in the evening or night, refreshed vegetation, so that the dryness of June proved less injurious than was expected.

DROMORE.—A bad month for harvesting; potatoes suffering much from blight.

WATERFORD.—The weather of the month was very unsettled, although there were no heavy rains. Atmosphere remarkably clear on 25th.

KILLALOE.—A very beneficial month for all purposes; a sufficiency of R, without excess to injure haymaking. Mean temp. 60°·4,

DUBLIN.—True to its traditional character, July was a very showery month, R falling on 25 days, compared with an average of 17·6 days; nevertheless the total did not quite reach the average, the explanation being that the R fell chiefly in the form of showers, the 28th being the only thoroughly wet day. The mean temp. (59°·7) was almost identical with the average of 20 years, and owing to the prevalence of clouds and the frequency of showers by day, the extremes were not great. Distant T was heard on 2 days, but Dublin enjoyed a complete immunity from T8S, and there was no H. Mean humidity 78; mean amount of cloud 6·4; prevailing winds S.E. and W.

EDENFEL, OMAGH.—The weather up to the 12th was a continuance of the magnificent summer which marked the latter half of June, but from the 13th a copious rainfall, accompanied by a calm, humid atmosphere, forced into luxuriance crops and foliage of every kind.

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# METEOROLOGY AT THE INTERNATIONAL HEALTH EXHIBITION.

A CONFERENCE was held at the Health Exhibition on Thursday, July 17th, and Friday. July 18th, under the auspices of the Royal Meteorological Society. The chair was taken on the first day by J. Norman Lockyer, Esq., F.R.S., and on the second day by Dr. J. H. Gilbert, F.R.S. The following papers were read, and discussions ensued upon them:—

*On some relations of Meteorological Phenomena to Health.* By J. W. Tripe, M.D., F.R.Met.Soc.

In ages long past these relations excited much attention, but the knowledge concerning them was of the vaguest kind; even now no

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great advance has been made, because it is only quite recently that we have been able to compare an accurate record of deaths with observations taken at a number of reliable meteorological stations. My remarks will refer to the relations between (1) meteorological phenomena and the bodily functions of man, and (2) between varying meteorological conditions and death-rates from certain diseases.

Too much attention is paid to the barometer, for it really indicates only the variations in the weight of air pressing on our bodies, and these produce but little effect on health, for the advantages resulting from a residence at mountain stations are chiefly due to the generally altered climatic conditions, and the total change in the daily habits.

Man can bear greater variations of temperature than any other animal, for a temperature of —70° F. can be safely borne in the Arctic Regions, and 120° F. has been registered in Australia, so that he can live in fairly good health within a range of nearly 200° F. The effects of high temperature vary greatly according to the humidity, the effect of a moist air being to prevent evaporation, and the consequent cooling of the body; the effects of temperature also depend on the extremes, for when the days are hot and the nights cool, the system becomes partially restored; hot climates are not necessarily injurious to Europeans, but their children certainly degenerate, and after two or three generations die out.

The direct influence of rain on man is not marked except by its giving moisture to the air, and by altering the level of ground water; when ground water has a level less than 5 feet below the surface, the locality is unsuitable for habitation. Varying amounts of moisture in the air materially affect the health and comfort of man, as not only the evaporation from the skin, but also the amount of effete matter carried off from the lungs, depends upon it.

Variations of pressure and temperature affect the circulation of air in the soil, and as this "ground air" is frequently combined with dangerous gases, its effect on health is at times considerable.

There are certain known relations between meteorological phenomena and disease, but on the other hand there are many unknown relations; for instance, small-pox, while of an ordinary type, will sometimes assume an epidemic form under meteorological conditions with which it usually declines. A mean monthly temp. below 44°·6 is adverse to the spread of scarlet fever, and deaths from this disease are most numerous with a temp. between 45° and 57° Diseases of the lungs, excluding consumption, are fatal in proportion to the lowness of the temp. and excess of moisture. The relations between high summer temp. and diarrhœa have long been seen, but the cause is not clearly known, and the reason for its excess in certain districts has not been discovered. With regard to the relation between meteorological phenomena and many diseases, such as sunstroke, liver diseases, yellow fever, cholera, whooping cough, measles, &c., our knowledge is very limited.

*(To be continued.)*

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## THE THUNDERSTORMS OF JULY, 1884.

### TUESDAY, JULY 8th.

SUSSEX.

*Littlehampton.*—T.

HANTS.

*Redlands, Emsworth.*—TS at 2 a.m.

NORTHAMPTON.

*Kilsby, Daventry.*—The railway station was struck about 3 p.m.; a guard who witnessed it described the appearance as that of a small cloud coming down to the chimney stack, and then knocking down part of the wall.

*Oundle.*—T.

WILTS.

*Pewsey.*—T.

STAFFORD.

*Heath House, Cheadle.*—TS.

WARWICK.

*Coventry.*—A young man named Wheatley was cleaning a tombstone and surrounded by tall elms, when he was struck and rendered unconscious; his hair was singed, his neck, back, and the calf of his leg were discoloured and badly burnt. Part of the crown of his hat was cut away, and the remainder divided into strips; the left leg of his trousers was torn from the knee downwards, and his left boot was cut into fragments. A cow and five lambs were killed.

*Leamington.*—A chimney in Sherbourne-terrace was demolished.

LEICESTERSHIRE.

*Ibstock, Market Bosworth.*—At 4.30 p.m. the postal telegraph instrument was struck and rendered useless, the dial being blackened. A gas-pipe was also partly severed.

*Long Whatton, Melton.*—Mr. Wilkins had a valuable horse killed.

*Loughborough.*—Very severe TS, 4.40 to 5 p.m.; about 0·50 in. of R in 10 minutes. Three cows were in a field at Meadow-lane, two



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were killed, one was in a shed being milked, the other was outside—where the third was is not stated—the man who was milking was struck but recovered.

*Stoney Stanton, Melton.*—About 7 p.m. two houses in the village were struck, and a very large oak tree was shivered.

*Whitwick, Ashby-de-la-Zouch.*—At 4.45 p.m. a large tree at Mr. Stinson's was shivered in fragments, also another at Mr. Biddle's and the chimney of Mr. Reed's house was damaged.

NOTTINGHAM.

*Carlton, Worksop.*—Cottage struck, but no one hurt.

LANCASHIRE.

*Breeze Hill, Liverpool.*—T L.

*Preston.*—A spinning mill in Derby Street was struck, as was also a boy named T. Ashworth, who was in a hut in a brick field at the top of Miller-road.

YORKSHIRE.

*Scarborough.*—TS.

WESTMORELAND.

*Shap.*—TS at 9.30 p.m.

## SCOTLAND.

ROXBURGH.

*Hawick.*—T.

FIFE.

*Newton Bank, St. Andrew's.*—TS and ·35 in. of R in 25 minutes.

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### WEDNESDAY, JULY 9th.

HERTFORDSHIRE.

*Baldock.*—Telegraphic instruments at the post office deranged. One heifer killed and another temporarily disabled.

*Bygrave, Baldock.*—An oak tree splintered.

*Hitchin.*—It is 20 years since I have had to chronicle such a deluge of rain as we had during the thunderstorm between 1.30 and 3 p.m.

My gauge at Oston Heal (one mile west) collected 1·19 in.
That at Wratten ... ... ... „ 1·75 „
And at Fairfield (three-quarter mile east) „ 2·75 „

The volume of water poured into the river in less than a quarter of a mile killed over 200 fine trout, to the total weight of three to four cwt.; every fish seems to have been suffocated by the rush of turbid water.—W. LUCAS.

*Stevenage.*—The clock on Colonel Medcalf's house at Aston was struck.

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NORTHAMPTON.

*Cold Ashby, Daventry.*—Mr. Evans's cottage struck, the chimney thrown down, and much damage done internally, but a child left on a bed was found uninjured.

*Oundle.*—Some sheep killed.

*Thrapston.*—A party of fishermen were making for shelter under a willow tree, when they saw it split in two by the lightning.

HUNTINGDON.

*Tetworth, Abbotsley.*—A bullock killed.

BEDFORD.

*Sandy.*—Heavy TS.

*Tempsford, Potton.*—Eleven bullocks killed beneath a tree.

CAMBRIDGE.

*Comberton, Cambridge.*—A farm was struck and much damaged, and two pigs were killed.

*Little Gransden, Caxton.*—Two trees struck.

NORFOLK.

*Diss.*—T in afternoon.

*Norwich.*—Two persons in different parts of the town were struck, and rather seriously injured. A chimney was struck in West Pottersgate-street.

*Martham, Yarmouth.*—At 8.45 p.m. Mr. Edmond's thatched barn was struck and ignited.

*Off the Norfolk Coast.*—The steamer "Cambria," on her voyage from London to Dundee, was struck about 7·30 p.m. while passing through Yarmouth Roads: the mast was shivered and other damage was done.

GLOUCESTER.

*Maisemore.*—TS.

HEREFORD.

*Ross.*—TS at night.

STAFFORD.

*Heath Ho., Cheadle.*—TS.

WARWICKSHIRE.

*Keresley, Coventry.*—Twelve sheep killed and several trees struck.

LEICESTERSHIRE.

*Great Bowden, Market Harboro'.*—A horse and a sheep were killed.

*Heather, Ashby-de-la-Zouch.*—Two beasts killed while grazing.

*Loughborough.*—Slight TS about 2.30 p.m.

*Thringstone, Whitwick.*—The chimney of the Vicarage was struck and one room damaged.

NOTTINGHAM.

*East Markham, Tuxford.*—Mr. H. Clark had a cow killed.

*Hodsock Priory, Worksop.*—Very heavy H and R. 2·04 in. in 24 hours. 1·34 in. fell between 3 p.m. and 4.20 p.m.



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*Upton, Southwell.*—Mr. Twidale had between 30 and 40 sheep killed under one tree.

*West Drayton, Tuxford.*—Mr. Richards had a cow killed while grazing in an open field.

DERBYSHIRE.

*Belper.*—Two villas damaged.

*Ilkeston, Derby.*—A signal box set on fire and the tower of the church damaged.

LANCASHIRE.

*Bilsborrow, Preston.*—Three cows in the fields killed.

*Claughton, Garstang.*—The Hall struck and slightly damaged.

*Heaton with Oxcliffe, Lancaster.*—Mr. Cottam had four lambs killed.

*Lancaster.*—Five out of the eight telegraph instruments were damaged.

*Royton, Oldham.*—Five men at work on a reservoir took shelter in a hut, two were killed and the other three injured.

YORKSHIRE.

*Bottom Boat, Wakefield.*—An old woman sitting by a cottage fireplace was killed, and her daughter who was near was injured.

*Bramley, Rotherham.*—Railway Station struck and roof ignited.

*Doncaster.*—A girl struck, who remained unconscious more than an hour.

*Howden.*—Mr. Noble had a valuable horse killed, and some haycocks on Mr. Simpson's land were ignited.

*Kilton-in-Cleveland, Guisborough.*—Mr. Judson with three men was carting hay, when all were struck by lightning and rendered unconscious.

*Meltham Mills Vic.*—A flash of L passed through the kitchen, melted some gas pipe in the cellar, and ignited the gas.

*Rothwell, Leeds.*—J. Hainsworth, engine driver at the collieries, was walking home with three men, when he was killed and the others were rendered insensible for a few minutes.

*Scarborough.*—TS.

*Stanley, Wakefield.*—Violent TS, a woman killed.

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## THURSDAY, JULY 10th.

BEDFORDSHIRE.

*The Lodge, Sandy.*—TS.

DEVON.

*Cookbury Wick, Torrington.*—TS.

YORKSHIRE.

*Normanton.*—Two girls struck, but each eventually recovered.

*Pocklington.*—Mr. Jackson's house at Moor Lane struck, and considerably injured.

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DURHAM.

*Whorlton.*—T and heavy R.

NORTHUMBERLAND.

*Unthank Hall, Haltwhistle.*—Heavy TS. with 2·10 in. of R.

SCOTLAND.

LANARKSHIRE.

*Motherwell.*—A cottage struck and some rooms entirely wrecked.

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**SATURDAY, JULY 12th.**

HERTFORDSHIRE.

*Cheshunt.*—Two horses killed.

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**SUNDAY, JULY 13th.**

TS with R at *Heath Ho., Cheadle*, STAFFORD; *Broughton-in-Furness*, LANCASHIRE; *Stanley, Wakefield*, YORKS; *Castle Lodge, Keswick*, CUMBERLAND; *Shap*, WESTMORELAND; *Hawick*, ROXBURGH; *Stronvar* and *Dalnaspidal*, PERTH.

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**MONDAY, JULY 14th.**

TS at *Newton Bank, St. Andrew's*, FIFESHIRE, with 0·07 in. of R in four minutes; *Stronvar*, PERTHSHIRE, at 3.30 p.m.; and *Forsinard*, SUTHERLAND.

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**TUESDAY, JULY 15th.**

TS at *Sandy*, BEDFORDSHIRE, and *Maisemore*, GLOUCESTERSHIRE.

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**WEDNESDAY, July 16th.**

T at *Castle Lodge, Keswick*, and *Newton Bank, St. Andrew's*.

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**THURSDAY, JULY 17th.**

T at *Heath Ho., Cheadle*, STAFFORDSHIRE, and TS at *Loughborough*, at 2.45 p.m.

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**SATURDAY, JULY 19th.**

TS at *Rendlesham Hall*, SUFFOLK, at *Diss*, NORFOLK, and T at *Heath Ho., Cheadle*, STAFFORD.

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**SUNDAY, JULY 20th.**

T at *Castle Lodge, Keswick*, CUMBERLAND.

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**THURSDAY, JULY 24th.**

MIDDLESEX.

*London.*—TS in afternoon.

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SUSSEX.

*Slinfold, Horsham.*—Five horses and two boys at Dedisham farm were knocked down; three horses were killed, one was blinded, the two boys and the fifth horse recovered.

*Addington, Winslow*, BUCKS, and *Oundle*, T, H, and R; *Rendlesham Hall*, SUFFOLK, TS, *Diss*, TS in afternoon; *Compton Bassett, Calne*, T L and H; *Pewsey*, WILTS, T; *Ross*, HEREFORD, TS at 3 p.m.; *Heath Ho., Cheadle*, TSS.

WILTS.

*Monckton Deverill, near Warminster.*—Twelve heifers standing beside a rolled wire fence with wooden posts were killed; they were standing in two lines, nine in one place, and three in another, the distance between the two groups being about 200 yards; fifteen of the wooden posts were damaged, and one much split. One cow was lying down close to the fencing, and was scarcely injured at all.

NOTTINGHAM.

*Nottingham.*—A milkman (J. Harris) was killed instantly while serving milk to some men working at a sewer; his hair was ignited.

TSS also occurred at *Breeze Hill, Liverpool*; *Newton Bank, St. Andrew's*, FIFESHIRE; and *Brook Lodge, Waterford.*

## FRIDAY, JULY 25th.

RUTLAND.

*Oakham.*—A flash of L struck the spire of the church, damaging the lightning conductor. It then entered the tower splintering the floor, and passing through entered the church and ignited the gas.

## SATURDAY, JULY 26th.

LANCASHIRE.

*Haverthwaite, Colton.*—At 8.50 a.m. there was a single flash of L, which struck the Blackbeck gunpowder works, exploded the corning house, killed three men, and ignited the clothes of the fourth.

## ADDENDA.

FRIDAY, 4TH.—*Banbury.*—TS. Animals were killed at several places near. In one discharge the flash is said to have moved slowly. In the course of the storm several trees were blown down or damaged by a revolving gust of wind of almost momentary duration.—*Carlisle.*—Stack struck in Blackfriars-street, and at another house in the same street the gas was ignited; Crown Inn, Botchergate, chimney struck.

SUNDAY, 6TH.—*Bolton.*—In the morning the Chadwick Orphanage was struck, also a chimney in Castle-street.

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## ON THE RAINFALL OF JAPAN.

(Based upon J. J. REIN'S *Japan*. London, Hodder and Stoughton.)

So little is generally known as to the rainfall of this great country, that we have extracted from Rein's book some of the leading facts, converted them into English measures, and arranged them as systematically as practicable.

| Stations. | Lat. North. | Lon. East. | No. of years observations. | MEAN RAINFALL IN INCHES. | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Year. | 6 months Oct.-Mar. | 6 months April-Sep. | Wettest month. | Driest month. |
| Tôkio .. ... | 35°40′ | 139°45′ | 5 | 65·40 | 23·87 | 41·53 | 13·27, Sept. | 2·29, Jan. |
| Yokohama | 35 26 | 139 49 | 7 | 70·63 | 24·92 | 45·71 | 10·20, Sept. | 2·36 ,, |
| Osaka ..... | 34 20 | 135 19 | 1 | 41·06 | 15·32 | 25·74 | 6·77, Oct. | 1·42 ,, |
| Nagasaki .. | 32 44 | 129 42 | 1 | 47·95 | 12·52 | 35·43 | 11·02, April | 1·06 ,, |
| Hakodate . | 41 46 | 140 45 | 9 | 51·85 | 23·03 | 28·82 | 8·35, Aug. | 2·24, Feb. & Mar |
| Sapporo .. | 43 4 | 141 23 | 1 | 45·40 | 27·05 | 18·35 | 6·61, Oct. | 1·54, April |

At Yokohama in one year Dr. Mourier collected only 41·66 in. September, 1878, was very wet, 18·98 in. fell at Tokio during the month, and 6·93 in. is reported to have fallen in 30 hours at Yokohama.

In Northern Japan some valleys have much snow, *e.g.*, in the valley of Tetori-gawa, in the province of Kaga, at an altitude of 700-800 metres (2297-2625 ft.) above sea level, 6 metres (19·7 ft.) is usual, and 2 metres (6·6 ft.) is an exceptionally small quantity.

The following table of monthly values consists partly of means and partly of absolute readings, but the third column gives the period over which the observations extended.

| Station. | Period of Observation. | Jan. | Feb. | Mar. | April. | May | June | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. |
| Tôkio ..... | 3 years. | 3·35 | 3·50 | 4·25 | 3·07 | 6·02 | 7·80 | 4·17 | 3·54 | 13·47 | 4·88 | 4·61 | 2·24 | 60·90 |
| ,, Knipping | 1873–77. | 2·29 | 2·48 | 5·32 | 3·58 | 5·47 | 7·95 | 5·28 | 5·98 | 13·27 | 7·52 | 3·35 | 2·91 | 65·40 |
| *Yokohama. | 1863–69. | 2·36 | 3·31 | 5·04 | 6·57 | 5·83 | 8·19 | 8·23 | 6·69 | 10·20 | 6·93 | 3·46 | 3·82 | 70·63 |
| †Osaka ..... | Dec'69 to Jan'71 | 1·42 | 1·50 | 1·53 | 3·70 | 5·08 | 2·83 | 5·00 | 3·42 | 5·71 | 6·77 | 2·64 | 1·46 | 41·06 |
| Nagasaki .. | 1872. | 1·06 | 2·32 | 3·51 | 11·02 | 4·88 | 5·67 | 2·60 | 5·75 | 5·51 | 1·18 | 1·77 | 2·68 | 47·95 |
| Hakodate . | 9 years. | 5·95 | 2·24 | 2·24 | 2·52 | 2·48 | 6·93 | 2·99 | 8·35 | 5·55 | 4·73 | 4·33 | 3·54 | 51·85 |
| Sapporo ... | 1876. | 3·31 | 4·96 | 3·07 | 1·54 | 2·87 | 3·54 | 1·93 | 4·65 | 3·82 | 6·61 | 6·42 | 2·68 | 45·40 |

* Dr. Hepburn. † Dr. Gratama.

## A HEAVY INDIAN RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Fred. Chambers, the acting superintendent of the Government Observatory, Bombay, has forwarded to me a copy of your magazine for June, 1884, in which some remarks are made regarding the heavy rainfall which occurred at Bhosawul on the night of 1st July, 1883. As I had already written upon the cause of the Surat floods, Mr. Chambers thought I might be able readily to supply the notes you had invited.

The 15·15 inches of rain which fell at Bhosawul between 6 p.m.

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of the 1st and 6 a.m. of the 2nd July last year, were due to a cyclone which crossed the Indian Peninsular from the head of the Bay of Bengal to the head of the Arabian Sea. The following is a brief history of the matter:—On the 26th June the Bengal Meteorological Office reported a cyclone to be forming at the head of the bay, and on the 28th the storm signals were hoisted in Calcutta to give warning that a cyclone was expected to pass inland between Saugor Island and False Point. On the morning of the 29th there had been a rainfall at False Point of over 10 inches, and the barometer at Saugor Island had during the preceding 24 hours fallen one-fifth of an inch, making a total fall of three-fifths in four days. On the 30th the centre of the cyclone had moved inland, and was over the hill districts of Orissa, and the barometer at Saugor Island had risen one-third of an inch. The next day (July 1st) the centre had moved as far westward as Seoni in the Central Provinces, and falls of 4 and 5 inches were reported from the stations about. By the morning of July 2nd, the centre of the cyclone had travelled to the neighbourhood of Indore, and very heavy rain had fallen over the hill districts which give rise to the Taptee and Nerbudda rivers, the heaviest falls having occurred in the Taptee valley. At Chikalda there had been a fall of over 21 inches in the previous 30 hours; at Amraoti they had 10·25 inches in the same period; at Akola 8·81 inches, at Buldana 7·01, and at Bhosawul in the previous 24 hours, they had the 18·25 inches which you have referred to. On the morning of the 3rd the centre was over Kutch, and severe gales were felt in Kattiawar and parts of Guzerat and Rajputana; at Rajkote they had a fall of 9·85 inches of rain during the preceding twelve hours. On the morning of the 4th the centre of the cyclone had moved out into the Arabian Sea, a little to the S.W. of Karachi, where it was encountered by the B. I. S. N. Co.'s steamer "Oriental," with the effect of causing her to lose her awning, some of her sails, and two of her boats. By the afternoon of the same day the storm was lost to further observation.

It was this cyclone which caused the flooding of the Taptee and the submergence of Surat. On the evening of the 3rd the river at Surat had risen 45 feet, higher by 3 feet than it was known to have risen before. The country for miles around was under water; in Surat the ground floors of many of the houses which were approached by flights of six or seven steps were covered with four or five feet of water; the B. B. & C. I. Railway embankments, both to the north and south of Surat, were seriously damaged, and the bridge over one of the Taptee tributaries was carried away; and all this in addition to the damage done to the G. I. P. Railway bridges.

The excessive damage done by this cyclone was due to the accidental position of the track of heavy rain, which was a little on the south side of the Satpura and Maha Deva Hills, thus causing by far the greater moiety of the drainage work to be done by the Taptee. Had the centre been only a little further north, the Nerbudda and Taptee rivers would have had an equal share of the work, and while

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of course there must inevitably have been considerable damage done, it would not have been so great as was actually the case.

The rainfall at Bhosawul of 15·15 inches in 12 hours was undoubtedly very unusual; the fall at Chikalda (near Elichpur) of 21·22 inches in 30 hours, was also very heavy.—Yours, &c.,

A. N. PEARSON,

Acting Meteorological Reporter for Western India.

*Meteorological Office, Bombay, 29th July, 1884.*

## METEOROLOGY AT THE INTERNATIONAL HEALTH EXHIBITION.

*English Climatological Stations.* By G. J. Symons, F.R.S.

The Royal Meteorological Society has equipped a Climatological Station in the grounds of the Health Exhibition, in order that anyone organizing a station may see one arranged in accordance with the regulations of the Society.

The object of the Climatological Station is to determine the elements of the climate of a place, hence only such instruments are used as are necessary for that purpose. From observations of these instruments, the highest, lowest, and mean temperatures, the range of temperature as well as the humidity of any locality, can be obtained. Each of these conditions exerts a great influence on health. This is especially true in the case of range of temperature as two places having the same mean temperature may vary considerably, one having a generally equable temperature, while the other is subject to great extremes of heat and cold.

It was in the hope that stations may be started at as many as possible of the English Health Resorts, that the Royal Meteorological Society equipped the Climatological Station. The Society has established 82 stations, from each of which, returns of observations, made with accurate and verified instruments, are received, and each station is regularly inspected by the Assistant Secretary. The positions of these stations are shown on the accompanying map,* and from a single glance, it is obvious that there is still room for many more.

*The Equinoctial Gales: Do they occur in the British Isles?* By R. H. Scott, M.A., F.R.S.

This was a re-examination of the results described in a previous paper on the subject, read before the Royal Meteorological Society,† and it confirmed in every particular the statements then made.

*Some Occasional Winds and their Influence on Health.* By W. Marriott, F.R.Met.Soc.

All winds may be regarded as caused directly by differences of atmospheric pressure, just as the flow of water is due to difference in level. The air flows spirally outwards from a region of high pressure, in the direction of the hands of a watch, in the northern

* The map is exhibited in the Meteorological Annexe at the Health Exhibition.

† See *Met. Mag.*, No. CCXXII. (July, 1884), p. 87.

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hemisphere, and spirally inwards in a region of low pressure, in the direction opposite to that of the hands of a watch. The movements are exactly the reverse in the southern hemisphere.

The wind most dreaded in this country is the East wind, it generally blows in the spring for several days together; it is dry, cold, and very penetrating.

"When the wind is in the East,
'Tis good for neither man nor beast."

Such winds blowing over the human body, tend to reduce the temperature of its surface, not only by conduction, but also by evaporating moisture from it, and rendering a large amount of heat latent.

The *Mistral* is a very dry and cold N.W. wind, which blows along the Gulf of Lyons; it is often strong enough to blow a man off his horse.

The *Scirocco* occurs along the North African coast, in Sicily, South Italy, &c.; it is a hot S.E. wind blowing from the Sahara. It is dry on the coast of Africa, but in crossing the Mediterranean it becomes moist; in Sicily it sometimes raises the temp. to 110° in the shade.

The *Simoom* occasionally visits the deserts of Kutchee, Upper Scinde, and similarly constituted tracts of country in the East. Sudden and singularly fatal in its effects, invisible and intangible, it passes like a knife through the air, leaving a well-defined narrow track marked by the sudden extinction of life, both animal and vegetable. At the close of the hot weather in 1856, five men were on their way from Kandahar to Shikarpoor, when the blast crossing their path, killed three of them and disabled the remaining two.

The *Hot Wind* is one of the features of the climate of Australia; it blows in November, December and January; it is very hot and dry, but not remarkably unhealthy; its actual temperature varies from 80° to 110°, but it seldom reaches 100°.

*Cumulative Temperature.* By R. H. Scott, M.A., F.R.S.

On the walls of the Meteorological Annexe will be found a series of diagrams, exhibiting for various districts in the United Kingdom the march of Temperature, Rainfall and Bright Sunshine. The object of these curves is to show clearly some of the most important factors in the growth of crops. As regards the three elements represented on the diagrams, the curves for rainfall and sunshine require but little explanation, as the successive steps of the curves show the successive weekly totals of rain or sunshine.

The case as regards temperature is, however, different, and those who examine the diagrams will see that there are two curves, one ascending, the other descending; the one red, the other blue. A certain arbitrary base line is assumed, and the values are measured above or below that line.

It is proved almost beyond a doubt, that each individual cereal requires a definite amount of heat to bring it to maturity. Thus maize requires more than wheat, and wheat again more than barley or oats.

Now various investigators, and notably Boussingault and Prof. Alphonse de Candolle, of Geneva, have devoted much attention to

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this subject, and the latter has come to the conclusion that a certain total amount of temperature above a definite base line is necessary for plant growth, and that this "sum of temperature" varies for each crop. He found that plants did not give indications of active vegetation until the temperature rose above 42° F., and this temperature is taken as the base for all the diagrams.

Although Prof. de Candolle propounded his views some years ago, at the Vienna Conference in 1874 meteorologists were quite at sea as to how these sums of temp. were to be calculated. This problem has been solved by Lieut.-General Strachey; he proposes to adopt as a unit of temperature, to supply a standard for calculation, one degree continued for the unit of time, either one hour or one day, as the case may be.

Such a unit may be conveniently called an hour degree, or day degree. The unit of time adopted for the calculations to which I am about to refer is a day, and the unit of what may be termed the effective temperature is therefore a *day degree*. A day degree therefore signifies one degree F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

The first step towards determining this effective temperature in day degrees resolves itself into determining the average temperature for the period under consideration. Most observers record the maximum and minimum temperatures once in 24 hours, and it is found that the mean of these readings is nearly the average for the day. If the max. and min. are both above 42° all the accumulated temperature is to the good; it is all on the positive side. If theyare both below 42° it is all on the negative side; but if one is above and the other below, one portion of the effective temp. is positive, and the other negative.

Now, General Strachey carried out a long series of calculations, based on the observed hourly temperatures at Kew Observatory, and at other stations in the United Kingdom, in order to ascertain the magnitude of the co-efficient by which the difference between either of these extreme temperatures and the base temperature (42° F.) should be multiplied so as to obtain the values of the temperatures in excess or defect of 42° F. expressed in day-degrees, and he found that this, *for a weekly period*, was 0·4.

Accordingly we get the following rules :—

If the mean of the day is above 42° F., we multiply the difference between the minimum and 42° by 0·4 (four-tenths), and call this *the negative effective temperature.*

To find the positive effective temperature we subtract from the difference between the mean for the day and 42° the negative effective temperature just determined.

If the mean of the day is below 42° F. the proceeding is similar; but we first ascertain the positive effective temperature, and subtract that from the difference between 42° F. and the mean, thus obtaining the negative effective temperature.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JAN., 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. | | | | Average. | | | | Absolute. | | Total Rain. | | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | | | | | | | | | |
| | Temp. | Date. | Temp. | Date. | Max. | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth. | Days. | Cloud. |
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 55·6 | 29 | 32·2 | 1 | 48·8 | 39·2 | 40·3 | 86 | 57·1 | 28·6 | 2·30 | 16 | 7·2 |
| Malta | 62·6 | 6 | 42·7 | 18 | 58·1 | 47·5 | 44·0 | 75 | 119·2 | 36·0 | 2·43 | 9 | 4·0 |
| *Mauritius* | 86·0 | 9 | 69·0 | 30 | 83·7 | 73·5 | 69·4 | 76 | 138·5 | 58·2 | 5·68 | 20 | 6·1 |
| Calcutta | 82·6 | 30 | 50·1 | 11 | 76·4 | 54·8 | 54·5 | 73 | 136·0 | 39·4 | ·02 | 1 | 1·4 |
| Bombay | 88·5 | 7 | 61·6 | 29 | 81·3 | 65·3 | 61·3 | 66 | 137·4 | 49·0 | ·03 | 1 | 0·4 |
| Ceylon, Colombo | 88·8 | 23 | 68·8 | 24 | 86·4 | 71·2 | 66·5 | 67 | 146·5 | 62·0 | ·06 | 2 | 4·0 |
| *Melbourne* | 97·8 | 19 | 45·1 | 18 | 74·0 | 54·1 | 50·2 | 65 | 156·2 | 36·0 | 4·75 | 11 | 6·1 |
| *Adelaide* | 110·2 | 13 | 45·1 | 21 | 80·8 | 59·5 | ... | 46 | 169·3 | 40·4 | 1·71 | 12 | 4·2 |
| *Wellington* | 70·8 | 2 | 45·5 | 5, 19 | 64·0 | 51·6 | ... | ... | 139·0 | 40·0 | 9·58 | 18 | ... |
| *Auckland* | 77·5 | 9 | 50·0 | 4 | 68·0 | 55·9 | 50·6 | 68 | 149·0 | 42·0 | 1·64 | 16 | 6·0 |
| Jamaica | 88·4 | 16 | 63·5 | 30 | 84·8 | 67·5 | 66·8 | 78 | ... | 56·5 | ·75 | ... | 3·2 |
| Barbados | 79·0 | 30 | 66·0 | 27 | 77·0 | 70·0 | 70·2 | 82 | 140·0 | 63·0 | 2·01 | 14 | 6·0 |
| Toronto | 40·1 | 30 | —13·1 | 25 | 23·1 | 7·6 | 14·7 | 85 | 100·0 | —22·0 | 3·30 | 19 | 8·3 |
| New Brunswick, Fredericton | 43·9 | 10 | —34·5 | 29 | 19·5 | —4·7 | 9·0 | 86 | ... | ... | 3·06 | 13 | 4·8 |
| Manitoba, Winnipeg | 30·0 | 17 | —44·5 | 3 | 0·6 | —22·0 | 0·5 | 86 | ... | ... | ·61 | 8 | 4·1 |
| British Columbia, Spence's Bridge | 49·0 | 8 | — 9·0 | 1 | 30·0 | 16·4 | ... | ... | ... | ... | ·00 | 0 | ... |

### REMARKS, JANUARY, 1884.

MALTA.—Mean temp. 52°·1; mean hourly velocity of wind 11 miles, on 14th the velocity averaged 30 miles for 7 hours, and on 28th 33 miles for 7 hours; the temp. of the sea fell from 61° to 59°. J. SCOLES.

*Mauritius.*—Rainfall ·26 in., mean temp. 0°·6, and mean hourly velocity of wind 0·8 mile below their respective averages. T on every day from 5th to 11th inclusive, and L on 15th. Prevailing wind S.E. to E. by N. The secondary glow has appeared occasionally, and lasted 1 hour 20 min. after sunset. C. MELDRUM, F.R.S.

*Melbourne.*—Mean temp. of air 3°·5 of dew point 2°·6, and mean pressure ·052 in. below their respective averages; mean degree of humidity 1, amount of cloud 1·0, and rainfall 3·15 in. above their respective averages. Prevailing wind S. and W., strong breezes on 7 days. Dust storms on 5th and 7th; L on 20th. Dull and showery from 20th to 28th, very heavy showers on 21st. R. L. J. ELLERY, F.R.S.

*Adelaide.*—The coldest January (excepting 1868) since 1856, the mean temp. (70°·2) being 4°·6 below the average, and the min. the lowest ever recorded in January. Some hot weather occurred in the first part of the month, but from 19th to 28th it was cold, squally, and showery, with H and T. The red glow was visible on clear evenings throughout the month. C. TODD.

*Wellington.*—Generally showery and squally till 23rd, the wind being frequently strong. On 20th R began, and 5·05 in. fell in 36 hours, doing considerable damage. Fine from 23rd to 27th, then showery. Prevailing wind, N.W.; mean temp. 5°·1 below average; rainfall thrice the average. R. B. GORE.

*Auckland.*—Weather singularly cold and variable, the mean temp. being considerably below the average of previous years. Rainfall comparatively small, but spread over an unusual number of days. T. F. CHEESEMAN.

BARBADOS.—The mean temp. (73°·3) was the same as the average of 25 years. The wind was from N.E., and averaged 14·3 miles per day, the extremes being 22·0 miles and 5·3 miles. Four days were overcast. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·73 | XI. | Carno, Tybrith ... ..... | 2·10 |
| ,, | Margate, Birchington... | ·53 | ,, | Corwen, Rhug ..... | 1·00 |
| ,, | Littlehampton ..... | 1·56 | ,, | Port Madoc ..... | 1·75 |
| ,, | Hailsham ..... | 1·90 | ,, | I. of Man, Douglas ..... | 1·47 |
| ,, | I. of W., St. Lawrence. | 1·12 | XII. | Stoneykirk, Ardwell Ho. | 1·42 |
| ,, | Alton, Ashdell..... | 2·41 | ,, | Melrose, Abbey Gate... | 2·52 |
| III. | Winslow, Addington ... | 1·54 | XIII. | N. Esk Res. [Penicuick] | 1·40 |
| ,, | Oxford, Magdalen Col... | 1·52 | XIV. | Ayr, Cassillis House ... | 2·26 |
| ,, | Northampton ..... | 1·80 | ,, | Glasgow, Queen's Park. | 2·71 |
| ,, | Cambridge, Beech Ho... | 1·47 | XV. | Islay, Gruinart School.. | 3·39 |
| IV. | Southend ..... | ·67 | XVI. | St. Andrews, Newton Bk. | 2·41 |
| ,, | Harlow, Sheering ... .. | ·95 | ,, | Balquhidder, Stronvar.. | 5·66 |
| ,, | Diss ..... | 1·19 | ,, | Dunkeld, Inver Braan.. | 2·23 |
| ,, | Swaffham ..... | 2·37 | ,, | Dalnaspidal H.R.S. ... | 5·10 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 2·25 |
| V. | Salisbury, Alderbury... | 1·38 | ,, | Forres H.R.S. ..... ... | 1·18 |
| ,, | Warminster ..... | 1·60 | XVIII. | Strome Ferry H.R.S.... | 6·07 |
| ,, | Calne, Compton Bassett | 1·45 | ,, | Lochbroom ..... | 1·94 |
| ,, | Ashburton, Holne Vic.. | 2·01 | ,, | Tain, Springfield..... | 2·20 |
| ,, | Holsworthy, Clawton... | 2·72 | ,, | Loch Shiel, Glenaladale | 7·16 |
| ,, | Lynmouth, Glenthorne. | 2·87 | ,, | Invergarry ..... | 3·45 |
| ,, | Probus, Lamellyn ..... | 1·78 | XIX. | Lairg H.R.S. ..... | 2·96 |
| ,, | Wincanton, Stowell Rec. | 2·04 | ,, | Forsinard H.R.S. ..... | 3·54 |
| ,, | Taunton, Fullands ..... | 1·40 | ,, | Watten H.R.S. ..... | 4·09 |
| VI. | Bristol, Clifton ..... .. | 2·74 | XX. | Dunmanway, Coolkelure | 1·96 |
| ,, | Ross ..... | 2·02 | ,, | Fermoy, Gas Works ... | 1·30 |
| ,, | Wem, Sansaw Hall..... | 1·95 | ,, | Tralee, Castlemorris ... | 1·42 |
| ,, | Cheadle, The Heath Ho. | 2·73 | ,, | Tipperary, Henry Street | 1·07 |
| ,, | Worcester, Diglis Lock | 2·26 | ,, | Newcastle West ..... | ·84 |
| ,, | Coventry, Coundon ..... | 2·41 | ,, | Miltown Malbay..... | 2·12 |
| VII. | Melton, Coston ..... | 1·74 | ,, | Corofin ..... | 2·40 |
| ,, | Ketton Hall [Stamford] | 1·51 | XXI. | Carlow, Browne's Hill.. | ·66 |
| ,, | Horncastle, Bucknall ... | 1·61 | ,, | Navan, Balrath ..... | 1·23 |
| ,, | Mansfield, St. John's St. | 2·37 | ,, | Mullingar, Belvedere ... | 2·21 |
| VIII. | Macclesfield, The Park. | 2·58 | ,, | Athlone, Twyford ..... | 1·98 |
| ,, | Walton-on-the-Hill..... | 2·34 | XXII. | Galway, Queen's Col.... | 1·58 |
| ,, | Lancaster, South Road. | 1·79 | ,, | Clifden, Kylemore ..... | 9·20 |
| ,, | Broughton-in-Furness .. | 1·39 | ,, | Crossmolina, Enniscoe.. | 2·85 |
| IX. | Wakefield, Stanley Vic. | 1·12 | ,, | Carrick-on-Shannon ... | 2·53 |
| ,, | Ripon, Mickley ..... | 1·51 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 1·54 | ,, | Rockcorry..... | 1·54 |
| ,, | East Layton [Darlington] | ·89 | ,, | Warrenpoint ..... | 1·00 |
| ,, | Middleton, Mickleton .. | ·92 | ,, | Newtownards ..... | 2·53 |
| X. | Haltwhistle, Unthank.. | 1·28 | ,, | Belfast, New Barnsley.. | 3·24 |
| ,, | Shap, Copy Hill ..... | ·86 | ,, | Cushendun ..... | 3·65 |
| XI, | Llanfrechfa Grange ..... | 2·16 | ,, | Bushmills ..... ..... | 3·97 |
| ,, | Llandovery ..... | 3·40 | ,, | Stewartstown ..... | 2·28 |
| ,, | Lower Solva ..... | 1·79 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 2·23 | ,, | Buncrana ..... | 3·92 |
| ,, | Rhayader, Nantgwillt.. | 3·32 | ,, | Carndonagh ..... | 3·81 |

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# AUGUST, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | ·89 | — 1·85 | ·30 | 27 | 10 | 88·4 | 8 | 45·7 | 26 | 0 | 0 |
| II. | | Maidstone (Hunton Court)... | ·61 | — 1·68 | ·33 | 27 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| III. | | Hitchin ..... | 1·76 | — ·52 | ·43 | 27 | 12 | 86·0 | 11 | 42·0 | 25 | 0 | 0 |
| ,, | | Banbury ..... | 1·94 | — ·76 | ·97 | 31 | 9 | 86·0 | 11 | 41·0 | 26 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·23 | — ·94 | ·35 | 31 | 11 | 86·0 | 11 | 37·0 | 26 | 0 | ... |
| ,, | | Norwich (Cossey) ..... | 1·46 | — 1·16 | ·49 | 19 | 11 | 88·5 | 11 | 41·5 | 27 | 0 | 0 |
| V. | | Weymouth (Langton Herring) | 1·35 | ... | ·40 | 31 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple ..... | 3·40 | — ·70 | ·80 | 31 | 11 | 87·0 | 8 | 43·0 | 26*b* | 0 | 0 |
| ,, | | Bodmin ..... | 2·19 | — 2·65 | ·79 | 31 | 14 | 78·0 | 23*a* | 47·0 | 5 | 0 | 0 |
| VI. | | Cirencester ..... | 1·79 | — 1·87 | ·62 | 31 | 11 | .. | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 2·35 | — 1·73 | 1·34 | 31 | 10 | 84·0 | 11 | 46·0 | 26 | 0 | 0 |
| ,, | | Tenbury (Orleton) ..... | 1·99 | — 1·73 | 1·07 | 31 | 12 | 87·0 | 11 | 41·0 | 5 | 0 | 0 |
| VII. | | Leicester ..... | 2·25 | ... | ·92 | 31 | 10 | 90·0 | 8,11 | 41·5 | 26 | 0 | 1 |
| ,, | | Boston ..... | 1·11 | — 1·50 | ·71 | 31 | 5 | 87·0 | 11 | 42·0 | 27 | 0 | 0 |
| ,, | | Grimsby (Killingholme)..... | 1·36 | — 1·56 | ·42 | 31 | 8 | 81·5 | 24 | 46·0 | 26 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·29 | ... | ·66 | 31 | 7 | 92·0 | 11 | 40·0 | 5,20 | 0 | ... |
| VIII. | | Manchester (Ardwick)..... | 1·75 | — 2·17 | ·50 | 31 | 8 | 85·0 | 11 | 47·0 | 26 | 0 | 0 |
| IX. | | Wetherby (Ribston Hall) ... | ·79 | — 1·84 | ·42 | 28 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 1·93 | — 3·87 | ·48 | 27 | 12 | 85·0 | 8 | 40·0 | 25 | 0 | ... |
| X. | | North Shields ..... | ·72 | — 2·37 | ·25 | 24 | 9 | 80·5 | 24 | 40·5 | 26 | 0 | 0 |
| ,, | | Borrowdale (Seathwaite)..... | 3·36 | — 7·68 | ·88 | 10 | 14 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 3·02 | — 2·31 | 1·06 | 31 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 1·70 | — 3·27 | ·90 | 31 | 13 | 80·0 | 10 | 39·0 | 26 | 0 | 1 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 3·36 | ... | 1·09 | 27 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·03 | — 2·16 | ·53 | 27 | 7 | 80·8 | 8 | 48·0 | 5 | 0 | 0 |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 1·32 | — 2·95 | ·46 | 27 | 12 | 83·6 | 8 | 39·0 | 29 | 0 | ... |
| ,, | | Hawick (Wilton Hill)..... | 1·32 | ... | ·51 | 12 | 7 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 1·27 | — 3·03 | ·31 | 31 | 11 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 6·47 | + 1·25 | 1·00 | 27 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 4·20 | ... | ·95 | 15 | 22 | 77·0 | 8 | 45·0 | 29 | 0 | ... |
| ,, | | Mull (Quinish)..... | 5·42 | ... | ·93 | 27 | 25 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 1·50 | — 2·58 | ·50 | 13 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·55 | — 1·78 | ·59 | 12 | 9 | 72·0 | 24 | 40·0 | 29 | 0 | ... |
| XVII. | | Braemar ..... | 2·46 | — 1·97 | ·50 | 12 | 19 | 76·0 | 12 | 35·8 | 27 | 0 | 2 |
| ,, | | Aberdeen ..... | 2·08 | ... | ·73 | 28 | 14 | 71·0 | ... | 40·0 | 28*c* | 0 | 0 |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 1·35 | — 1·65 | ·33 | 28 | 7 | 77·0 | 10 | 39·0 | 27 | 0 | 1 |
| XIX. | | Dunrobin ..... | 2·31 | ... | ·79 | 28 | 12 | 71·5 | 6 | 41·0 | 27 | 0 | ... |
| ,, | | Orkney (Sandwick)..... | 2·81 | — ·09 | ·82 | 28 | 12 | 69·7 | 6 | 44·3 | 27*d* | 0 | 0 |
| XX. | IRELAND. | Cork (Blackrock) ..... | ·73 | — 3·10 | ·13 | 10 | 13 | 88·0 | 8 | 45·0 | 31 | 0 | 0 |
| ,, | | Dromore Castle ..... | 2·89 | ... | ·55 | 29 | 15 | 72·0 | 19 | 41·0 | 28 | 0 | ... |
| ,, | | Waterford (Brook Lodge) ... | ·62 | ... | ·30 | 12 | 10 | 79·0 | 7 | 39·0 | 26 | 0 | 2 |
| ,, | | Killaloe ..... | 1·44 | ... | ·30 | 17 | 11 | 74·0 | ... | 45·0 | 23 | 0 | ... |
| XXI. | | Portarlington ..... | 1·20 | — 1·87 | ·26 | 12*e* | 16 | 78·0 | 11 | 43·0 | 28 | 0 | ... |
| ,, | | Dublin (FitzWilliam Square) | ·78 | — 2·40 | ·34 | 27 | 8 | 74·9 | 12*e* | 44·6 | 29 | 0 | 0 |
| XXII. | | Ballinasloe ..... | 2·42 | — 1·61 | 1·28 | 16 | 18 | 72·0 | 8,9 | 40·0 | 5 | 0 | ... |
| XXIII | | Waringstown ..... | 1·86 | — 1·58 | ·61 | 27 | 16 | 83·0 | 9 | 41·0 | 28 | 0 | 0 |
| ,, | | Londonderry (Creggan Res.). | 3·46 | ... | ·97 | 16 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 2·41 | — 1·24 | ·60 | 16 | 17 | 75·0 | 8,9 | 42·0 | 28 | 0 | ... |

*a* And 24. *b* And 27, 29. *c* And 29. *d* And 28. *e* And 17.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

[For details respecting the thunderstorms, see separate article.]

## ENGLAND.

BANBURY.—The weather was exceedingly favourable for harvest, which was nearly completed by the end of the month. The R at the end was very useful for grass and green crops. Harvest the best for some years. Mean temp. 63°; average amount of cloud at 9 a.m., 5·9; the max. in shade reached 80° on 7 days; T and L on 3 days.

CULFORD.—The weather of harvest-time was most favourable and the crops were all gathered in in excellent condition; frost on grass on 26th.

LANGTON HERRING.—From the beginning of the month to the 24th, only ·22 in. of R fell, and all the wheat crop in this neighbourhood was ingathered under the most favourable circumstances. The mean temp. at 9 a.m. was 1°·9 above the average of 12 years; on the 9th the temp. at 9 a.m. was 75°, which is 1° higher than that registered at that time on any other day during 12 years; the range of pressure was very small. Violent TS on 24th from 9 to 12 p.m.

WOOLSTASTON.—An exceptionally hot and dry month; mean temp. 62°·4. The harvest generally was secured in splendid condition. A great fall of temp. occurred in the last week of the month.

ORLETON.—Remarkably fine and hot, with a very high day temp. till the 24th, but the nights were generally clear and cold. The temp. rose above 80° on 8 days. On the 25th the wind changed to the northward, and the remainder of the month was cold, the temp. being below the average. The mean of the month was 2°·7 above the average of 23 years, and has only once been exceeded during that period. Very little R fell till the 31st, when more than 1·25 in. fell in 24 hours. L was seen on 8th, and distant T heard on 10th. A very favourable month for the harvest.

LEICESTER.—The early part of the month was hot and dry, the temp. in shade rising to 90° on the 8th and 11th, and to 139° in the sun on the 11th. A very sudden change occurred late in the month, on the 24th the max. was 85°·6, on the 25th 68°·5, and on the 26th, 56°·8. A very useful fall of ·92 in. of R occurred on 31st.

KILLINGHOLME.—A month of splendid weather; corn carried in first-rate condition. Yield moderate on heavy land; a welcome fall of R occurred on 31st. Harvest general by the 8th.

MANCHESTER.—An exceedingly fine month; there were 20 days of unbroken, fine, sunshiny weather. The temp. during the first half was high, reminding one of old-fashioned summers, but towards the end the weather broke, and the temperature fell considerably. The month was very fine for harvest operations, and there is every reason to think that the year will prove to be fully an average, or above, for cereal produce. Long-continued thunder on the 9th.

## WALES.

HAVERFORDWEST.—A remarkably fine month, with a great amount of sunshine; the driest and finest August since 1880. T and magnificent sheet L on 10th, and again on 24th. The 24th was very hot (max. 78°·0) but a change of wind from S.E. to N.W. and N.N.E. followed, and the max. of the 25th was only 60°·6, with a min. on the morning of the 26th of 39° in air, and 32° on grass. The month ended much cooler, with refreshing rain. The temp. exceeded 70° on 17 days, and reached 80° once, and nearly reached it on 7 other days. The weather was everything that could be wished for to secure a fine harvest.

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LLANDUDNO.—Altogether a splendid month. Such an August has not been equalled here for 10 or 11 years, the weather being dry, sunny and warm. The mean temp. was fully 2 per cent above and the rainfall 66 per cent. below the average; R fell on 7 days only, the average being 14·5, and there were 200 hours of bright sunshine during the month. The daily range of temp. was just the average, and the monthly range but slightly above it. The health of the community was excellent.

## SCOTLAND.

CARGEN.—Mean temp. of the month 1° above the average. A severe TS occurred on 12th, causing a good many accidents to stock in the district; T or T and L on 4 other days.

HAWICK.—TSS occurred on the 10th, 11th and 24th, the rest of the month was most genial and kind.

OBAN.—Although the customary break in the weather came on the 12th (accompanied by heavy T and L and R) the month was on the whole a fair one, and there is a promise of a good harvest. The change was preceded by a heavy white fog, a common coincidence this summer. T and L also on the 8th.

BRAEMAR.—A very fine seasonable month; crops maturing rapidly. T and L on 9th, 11th and 14th.

ABERDEEN.—Rainfall about 1·25 in. below the average for August. The prevailing winds were southerly to south-westerly. Very fine weather was experienced throughout the month. T and L on 12th and 24th; H on 25th.

CULLODEN.—The month was particularly fine, warm, and dry. Little R fell except in T showers. The period between the 1st and 9th was fair and dry; from 9th to 18th heavy TSS were prevalent; from the 19th to the end of the month fair and fine harvest weather prevailed.

SANDWICK.—The temp. of August was 1°·3 above the mean of 57 years, and the rainfall rather below it. T and L on the 11th and 13th, and T on the 23rd. The weather was generally pleasant, and favourable to vegetation. Harvest begun.

## IRELAND.

DROMORE.—On the whole a fair month, but there were some very heavy winds from N.N.W.

WATERFORD.—Very little wind during the month; rainfall 2·99 in. below the average of ten years. Frequent heavy dews, and occasional T.

KILLALOE.—A splendid harvest month, only interrupted towards the close by some heavy showers, bringing up a wonderful crop of mushrooms all over the county. Mean temp. 61°·1.

DUBLIN.—A very fine and summerlike month, with high temp. and scanty rainfall. The prevalent winds were S.E. to S.W. and moderate in force; mean temp. 60°·3, 1°·4 above the average of 20 years. Rainfall the smallest for any August during 20 years, and rainy days only half the average. T and L on 11th; L on 13th, 14th and 28th. Mean humidity 78; mean amount of cloud, 5·7.

BALLINASLOE.—The month generally was fine. Very heavy R on the afternoon of the 16th, ·20 in. fell between 3.10 and 3.30 p.m.

EDENFEL, OMAGH.—The first half of the month was generally hot and clear; the latter half showery and humid, but as a whole it was very favourable. Harvest commenced here on 20th, three weeks earlier than last year.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXV.] OCTOBER, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## METEOROLOGY AT THE HEALTH EXHIBITION.

IN a previous number we gave a brief abstract of the papers read at the Conference held at this Exhibition, but as regards the exhibition itself, we have been restrained from comment at an earlier date by our determination to write nothing upon the subject until the awards of the Juries were announced.

The day has not yet come when scientific instruments are considered worthy of as good a position as a wax model of a big turnip, or when thermometers are regarded as having as much to do with health as the design on the outside of a cup. Music and daintily dressed dairymaids draw great crowds, and therefore get the best positions; while Meteorology and Mr. Francis Galton's important Anthropometric laboratory are honoured with the use of an iron shed which nobody else would have.

We leave our readers to consider whether Health or Profit has been the primary consideration.

However, late as the publication of the awards has driven us, we have to tell our readers as tersely as possible what to look for in the short interval yet remaining; and there are several objects of considerable interest.

We need not stop long in the meteorological section itself. Our readers will find that the leading London firms, Casella, Hicks, and Negretti & Zambra, maintain their high position. The following are among the chief novelties:—

**Casella.**—Six's thermometer with adjustable electric contacts so that a bell can be rung on the temperature rising above or falling below any desired temperature; this is, we believe, the only hermetically sealed thermometer with which this can be done.

**Denton** shows the set of thermometers exhibited by him at the Royal Meteorological Society, and, as upon the Jury requiring them to be reverified at Kew, the errors remain the same as they were in 1881, this maker must be congratulated on having effected one of the greatest improvements in mercurial thermometers yet made.*

**Hicks.**—An air meter, with sand glass attached; this is very

* *Met. Mag.*, Vol. xvii. (1882), p. 168.



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handy for ventilation measurements. Extremely delicate and sensitive clinical thermometers.

**Negretti & Zambra.**—A dry and wet bulb thermometer, ringing a bell on any required temperature being reached; and a large dial electrically recording anemometer; this firm also shows a set of its turnover thermometers.*

**Watson.**—We may also mention an ingenious but not rigorously accurate thermometer shown by Watson; it is a mercurial thermometer, with a rather large bulb, and divided on the stem; at about three inches from the bulb a wire is coiled round the tube and the two ends of the wire project and rest on a little double bracket, the position of these centres is such that when the temperature rises the upper part of the thermometer becomes heavier, and the thermometer takes a position more nearly horizontal than before; when the temperature falls, the density of the mercury in the bulb increases, the length of the column becomes less and the thermometer becomes more nearly vertical. The temperature is, therefore, shown not merely accurately on the tube itself, but also approximately, and at a distance of many feet, by the inclination of the tube of the thermometer, which points to a very boldly engraved metallic arc, with the degrees in large figures. For hospitals, and many other purposes, these thermometers, if durable, will be useful.

In the grounds will be found a complete climatological station, equipped and worked under the superintendence of the Royal Meteorological Society, with Stevenson's stand, sunshine recorder, &c. A very useful little "Memorandum on Climatological Observations and their relation to Public Health," has been distributed gratuitously by the Society.

At the back of the dairies are a Montsouris thermometer stand, rain gauge, &c., as used at the normal schools of France.

In the Belgian Court will be found the publications, &c., of the *Société Royale de Médécine Publique de Belgique*, a body which is studying with great care the relations between meteorology and disease. Some details of the climate of Carlsbourg, Paliseul, will also be found, exhibited by The Christian Brothers' Institute.

**Richard Frères.**—In a dark corner of the French Court will be found an exhibit of the highest interest, that of Messrs. Richard Frères, which contains a collection of self-recording meteorological instruments, which, considering both quality and price together, are unequalled. Messrs. Richard, with wisdom and justice, do not claim that their instruments should be regarded as absolute standards, but they work very well (*e.g.*, it is quite exceptional for the thermograph to be 1° F. in error, and yet it only requires five minutes' attention once a week) and are an indescribable comfort to observers who wish their records to be beyond suspicion. The barograph is well-known, having been imported into this country and sold by hundreds, although not with Messrs. Richard's name. The firm also exhibits

* See *Met. Mag.*, Vol. xviii. (1883), p. 150.

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recording hygrometers, rain gauges, &c. As we hope ere long to describe these instruments fully, and to engrave them, we do not now enter into details.

M. Marie Davy, Director of the Montsouris Observatory, Paris, shows patterns of some of the instruments used there, also engravings and views of the observatory and of all the instruments, as well as a series of the publications.

Among the Japanese exhibits will be found a very interesting collection of tables and diagrams relating to the climate of that country.

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## THE THUNDERSTORMS OF AUGUST, 1884.

### SATURDAY, AUGUST 9th.

#### SURREY.

*Addlestone.*—Woburn Park Hotel struck.

*Chertsey.*—Rick on Mr. Vincent's land in Staines Lane struck and burnt.

*Hatchlands, Addlestone.*—The house of Mr. R. Roake, chimney struck, and ornaments in room damaged.

*Ripley, near Woking.*—G. H. Mitchell sheltered under a tree and was killed by a flash of L; the tree was much damaged.

#### LEICESTER.

*Melton.*—Offices at cattle market struck and much damaged.

#### LINCOLN.

*Stamford.*—St. Michael's Rectory struck, and curtains ignited.

#### NOTTINGHAM

*Sneinton.*—A child named Spinks killed in bed.

#### DERBY.

*Charlesworth, Glossop.*—Two cows killed and a house wrecked.

*Hayfield.*—Two houses struck, a girl injured, and several trees split.

#### CHESHIRE.

*Armhill.*—Pig struck, and horse belonging to Mr. J. Clayton killed.

*Staleybridge.*—A chapel, farmhouse, and other buildings struck.

#### LANCASHIRE.

*Ashton-under-Lyne.*—Several buildings damaged and flooded.

*Burnley.*—Man and woman killed. Several houses struck and a man rendered insensible.

*Darwen.*—A young man named Marsden, living in Duckworth-street, was killed by the L while playing at football; another young man named R. Farnworth was seriously injured.

*Padiham, Burnley.*—Farm-house struck, and a girl badly burnt.

*Rochdale.*—The petroleum works of Mr. Andrew Scott were set on fire by the lightning, and destroyed.



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*Rossendale Valley, Lancashire.*—Good deal of damage by H and R; hailstones three inches long, and one inch thick, frequent; 186 squares of glass broken in the Catholic school, Newchurch.

*Royton.*—Lightning struck, and set fire to the Royton Cotton Mills, but the damage was confined to a portion of two rooms.

YORKSHIRE.

*Barnsley.*—S. Carrington, stoker at Messrs. Craikes's Collieries, struck, and seriously hurt.

*Cheapside.*—Two houses much damaged.

*Hayton.*—Cow killed.

*Helmsley.*—An ash tree near the station was struck.

*Norwood, Beverley.*—House struck and injured.

*Queensgate Road, Beverely.*—Haystack set on fire.

DURHAM.

*Billingham, Stockton.*—Cow killed.

*Preston, Stockton.*—A cow belong to Mr. R. H. Appleton was killed.

*Spennymoor, Hartlepool.*—Chimney of a house in South-street struck and split; Mrs. Wheatley sitting in the kitchen with a child, was covered with soot from the chimney, but not injured.

*Stockton.*—Lightning struck a house in Finkle-street, fused a gas pipe, and set the premises on fire. A horse, belonging to Mr. Pearson, in a field behind St. Peter's Church, was struck.

ROSS.

*Lochalsh District.*—Four sheep killed near Auchtertyre.

## SUNDAY, AUGUST 10th.

YORK.

*Mickleton-in-Teesdale.*—Several sheep killed in the higher parts.

*Moorhouses, Pateley Bridge.*—A barn, occupied by Mr. Joseph Hall, was struck and set on fire, and the building and contents destroyed.

*Thoralby Hawes.*—Cow killed belonging to Mrs. Scott.

*Whitbrigs, Mickleton-in-Teesdale.*—The house of Mr. John Burney was struck by lightning, which descended the chimney into the parlour, knocked a hole through the wall, and ignited some hay.

ISLE OF MAN.

*Kirkmichael.*—A hotel was partially destroyed.

## MONDAY, AUGUST 11th.

WARWICK.

*Camphill, Birmingham.*—Tenement in Abbey Green shattered, the occupant (J. Burton) escaped unhurt.

*Higham.*—House struck and greatly damaged.

LANCASHIRE.

*Bury.*—Theatre and Free School struck, but not much damaged.

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YORK.

*Bedale District.*—Many trees struck and considerable damage to stock and buildings, a valuable dog killed.

*Easingwold.*—Gable end of a warehouse struck.

*Hawes Junction.*—Horse killed belonging to Mr. Metcalfe of Moorcock Inn.

*Little Langton, Northallerton.*—A stonemason named Taylor took his little girl in his arms to carry her to shelter but was struck by L and killed on the spot, the child being uninjured.

*Low Hawkhills, Easingwold.*—A wall knocked down.

*Masham.*—A few trees struck.

*Park House Farm, Newburgh, near Easingwold.*—Thirty-one lambs belonging to Mr. Brown were killed under a tree.

*South Moors, Easingwold.*—A cow killed.

*Thirsk.*—L very destructive on the east side of the town.

MONMOUTH.

*Newport.*—L played about the waggons on the goods bank for some time. Three men employed about them were struck, but not seriously injured.

MONTGOMERY.

*Berriew.*—A farmhouse called Cefn Rallt was struck, ignited, and burnt to the ground.

ISLE OF MAN.

*Ramsey.*—House struck (Mr. Kellow Lucas's) the roof and furniture in more than one room much damaged. A nurse and children had marvellous escapes. Another house was struck, the furniture damaged, and a young man temporarily stunned.

ABERDEEN

*Braemar.*—Some trees struck, and a short distance beyond the Linn of Dee on the N. side of the river, the face of the hill was serrated, and scores of tons of rock, &c., dislodged; at the close of the storm rain fell for about five minutes very like a waterspout.

BANFF.

*Glenrinnes.*—Parish church struck and set on fire.

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## TUESDAY, AUGUST 12th.

MIDDLESEX.

*London.*—Stack of chimneys thrown down at house in Mile End-road, and one of the telegraph wires crossing Mile End-road, near Leslie-street, was severed. A chimney-stack was struck at a public-house in Sandringham-road, West Hackney.

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ESSEX.

*Chingford.*—Two trees opposite the Royal Forest Hotel were shivered.

*Waltham Abbey.*—Two horses were killed on Waltham Marsh.

NORFOLK.

*Bacton.*—Mrs. Little, coming down stairs with a child in her arms, was killed; the child was only slightly scorched.

*Congham, Lynn.*—Two horses, working in a harvest-field, killed.

*Dilham.*—A bullock killed.

*Honing.*—Stack of hay burnt.

*Ludham.*—Two cottages set on fire by L and destroyed.

*Worstead.*—Two stacks of hay ignited, and partially consumed.

*Yarmouth.*—Lightning passed through the roof and two floors of a house in Albert-square, doing much damage to furniture.

LINCOLN.

*Grimsby Docks Railway Station.*—Signal-post struck, and a piece broken off, and an old carriage at the G.N.R. goods-yard was struck.

*Waltham.*—Corner of a house thrown down.

*West Marsh, Grimsby.*—Chimney-stack struck in Ayscough-street, and the brickwork, the roof, and a fireplace damaged.

YORK.

*Alne, Helmsley.*—Cow killed while grazing in a field.

*Lartington Station, Barnard Castle.*—Chimney about 9 ft. high knocked down, damaging roof.

*Levisham, Whitby.*—Hailstones fell one inch and a half in circumference.

*North Ormesby, Middlesboroagh.*—A milk-woman was struck, and rendered insensible.

*Old Ormsby, Middlesborough.*—A labourer was killed by the electric fluid while at work in a field.

*Scalby.*—A ball of lightning went down a chimney, destroying much furniture.

*Scarborough.*—Stack fired by L in Filey-road.

*Yedingham, Scarborough.*—Three horses killed, and some sheep killed on the wolds.

DURHAM.

*Barnard Castle Moor.*—Three brothers named Stoddart were struck, but not much hurt.

*Stockton.*—The works of the Tees Scoriæ Company were struck. A house in Tilery-terrace was struck, and the roof almost stripped, and a house in Teesdale-street, South Stockton, had the roof and windows damaged.

*Westholm, Barnard Castle.*—Oak tree cleft from top to bottom.

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WESTMORELAND.

*Kendal.*—A large barn containing hay was destroyed.

*Old Hutton, Kendal.*—The church was struck, and the spire partially demolished.

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## SCOTLAND.

WIGTOWN.

*Little Hills, Kirkinner.*—Two cows killed.

*Wigtown.*—The L struck the chimney of Rochdale House, split it, entered the kitchen, melted the gas pipe and lighted the gas.

KIRKCUDBRIGHT.

*Bettyknowes.*—Two horses killed.

*Market Hill, Castle Douglas.*—Photographic studio partially wrecked.

*Netherthird.*—Foal killed.

*Queen Street, Castle Douglas.*—Gable of a house struck, and the chimney wrecked.

*South Park.*—Five calves killed.

DUMFRIES.

*Corrie Knowe, Annan.*—Farmhouse struck, the L passing down the chimney, knocking out a grate and disarranging the furniture.

*Gottesbie, Applegarth.*—Two cows killed while grazing.

*Halldykes.*—Eight lambs on the way to Lockerbie for sale, were struck at Halldykes and killed.

*Solway Cottage, Annan.*—Chimney struck.

*Tundergarth Mains, Lockerbie.*—Barn struck and damaged.

*Wamphraygate, Annandale.*—Nine cattle struck, eight of them being killed outright.

BERWICK.

*Lauder, Burnfoot.*—Three sheep killed.

*Lauder.*—The Earl of Lauderdale, riding a pony on the moors, was struck and only lived a few hours, the pony was killed instantly. Two keepers attending him were unhurt, though dazzled by the L.

HADDINGTON.

*Prestonpans.*—Chimney of the Free Church Manse struck and split, and the chimney of Mrs. Copeland's house also struck.

*Tranent.*—Two houses in the village struck, and a dog killed.

EDINBURGH.

*Broomhills, Burdiehouse.*—Haystack set on fire and burnt, the L was seen to roll along the ground like a ball of fire for a considerable distance before striking the stack.

*Dalkeith.*—A sheep in a field by Bonnyrigg-road was killed, and a tree in the same neighbourhood was struck.

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*Edinburgh.*—A house in Bristo-street was set on fire, and the Clarendon Hotel was struck. At the Caledonian Station, West Princes Street, the gas was ignited near the roof, but practically no harm was done; a chimney stack in Dalkeith-road was damaged, a chimney struck at Bruntsfield-crescent, and at Quarry Holes, Easter-road two telephone wires were destroyed. The gable over the east window of the Chapel Royal at Holyrood was struck and a quantity of stone dislodged. The lightning conductor at St. Giles' was three times struck about noon. A gentleman passing along Easter-road "observed dropping from the clouds an immense ball of fire, on nearing the ground it burst with a terrific crash, leaving a cloud of smoke."

*Gilmerton.*—A girl at West Edge was kneeling beside her father in the cottage, when she was struck by L and killed, one of the father's arms was scorched, but he was not seriously injured.

*Granton Pier.*—A signalman at the North British Railway loading slip had his flag struck from his hand and his arm was affected for some time. Another railway official standing on the line experienced a slight shock.

*Harden Green, Dalkeith.*—A man struck by L and severely injured.

*Leith.*—North Trinity House was set on fire and considerable damage done, and Grecian Cottage, Trinity, was also struck. A tenement in Mitchell-street was struck and two of the fire grates forced out, and the gas ignited; the roof of Bonnington sugar refinery was struck, and it is reported that at the premises of a wine merchant in Constitution-street, the L struck a bottle that was being washed by a lad, though he was unhurt.

*Little Catpair Farm, Stow.*—A man named John Mackay, going up to the farm about 3 p.m. with a water cart was killed by the L, the horse was also killed.

*Newbattle.*—A sheep killed and a hay stack set on fire and burnt.

*Newhaven Police Station.*—Gas ignited and telegraphic communication destroyed.

LINLITHGOW.

*West Benhar.*—Two women working near the pits were struck and severely scorched.

*Whitburn.*—The house occupied by the manager of the gas works was struck and the roof set on fire; the grate in the parlour was thrown into the middle of the room.

*(To be continued).*

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## HEAVY RAIN DURING GALE OF OCTOBER 13TH, 1881.

*To the Editor of the Meteorological Magazine.*

SIR,—Your letter of Feb. 23rd last has been mislaid during my change of residence, so please excuse so late a reply. I have looked up the notes I have on rainfall on Plynlimmon, in October, 1881, when I was engaged in securing a water supply for the town of Aberystwith from Llyn-Llygad-Rheidol, which is situated on the north-west of the Plynlimmon range. The Llyn is 1,650 feet above the sea—the water area on completion of the work was 12 acres—the area of gathering ground, 133 acres. In order to secure storage of water for Aberystwith, the Llyn was *tapped* 15 feet under its natural overflow; consequently, the water was run off to this depth by opening out the ground to the north of the Llyn, which work was carried out during the months of August, September, and October of the year 1881.

When the embankment was completed and the outlet valve closed, it was found that between 4 p.m. on the 13th and 8 a.m. on the 14th of October, 1881, the lake filled 6 feet, over a mean area of 10½ acres, being equal to a rainfall of 5·6 inches, in 16 hours.

It would be valuable and interesting if a record of the quantity of water carried at certain points of our rivers was tabled in connection with the rainfall on the contributary watershed. A gauge is now placed to one of our Severn Bridges here, which may be of help in recording for the Upper Severn and Vyrnwy.

I am, yours faithfully,

THOS. S. STOOKE.

*31, St. John's Hill, Shrewsbury. 20th Sept., 1884.*

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[This, from both a meteorological and an engineering standpoint, seems one of the most important records that we have met with. Meteorologists will not soon forget the gale which prevailed during the day mentioned by Mr. Stooke. According to Mr. Harding's maps,* the centre of the storm passed during the hours mentioned, from about 300 miles W. of Ireland to the vicinity of Edinburgh. This rainfall must, however, have been very local, for (though there was a heavy fall in the north of Glamorganshire) the stations nearest to Plynlimmon had an unsually *small* fall, the totals for the whole month being :—

| | in. | | in. |
|---|---|---|---|
| Cardiganshire, Goginan ... | 2·50 | Radnorshire, Nantgwillt ... | 5·54 |
| ,, Gogerddan .. | 2·67 | Montgomery, Llangurig .. | 2·80 |
| ,, Cwmsymlog. | 3·05 | ,, Llanidloes ... | 3·50 |

The nearest of these stations is, however, 7 miles from Llyn-Lygad-Rheidol.—ED.]

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* Quarterly Journal Met. Soc., Vol. VIII., p. 17.

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# CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1883.

| Stations. | Absolute. | | | | Average. | | | | | Absolute. | | Total Rain. | | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | Max. | Min. | Mean. | Dew Point. | Humidity. | Max. in sun. | Min. on grass. | Depth. | Days. | Cloud. |
| | Temp. | Date. | Temp. | Date. | | | | | | | | | | |
| London ..... | 85·6 | June 29 | 22·4 | March 24 | 58·2 | 42·7 | 50·5 | 43·1 | 81 | 125·5 | 19·3 | 24·40 | 164 | 6·2 |
| *Mauritius* ..... | 86·1 | Mar. 14 & 18 | 58·0 | July 25 | 78·7 | 69·2 | 74·0 | 64·8 | 74 | ... | ... | 47·69 | 180 | 5·9 |
| Calcutta ..... | 100·2 | May 24 | 46·2 | February 8 | 85·7 | 69·6 | 77·7 | 68·8 | 77 | 163·0 | 32·3 | 52·58 | 122 | 4·7 |
| Bombay ..... | 92·5 | April 17 | 61·0 | February 2 | 85·2 | 73·9 | 79·6 | 71·1 | 76 | 149·4 | 46·2 | 90·18 | 123 | 4·1 |
| Ceylon, Colombo. | 92·0 | April 4 | 67·8 | February 10 | 86·0 | 75·3 | 80·7 | 71·4 | 74 | 156·0 | 60·0 | 103·61 | 162 | 7·0 |
| *Melbourne* ..... | 104·9 | January 15 | 31·7 | July 23 | 68·1 | 49·7 | 58·9 | 47·4 | 70 | 165·0 | 26·2 | 23·70 | 130 | 5·9 |
| *Adelaide* ..... | 109·5 | January 15 | 34·2 | July 20 | 71·7 | 52·9 | 62·3 | 47·0 | 59 | 174·0 | 25·1 | 26·76 | 159 | 4·8 |
| *Wellington* ..... | 85·0 | February 21 | 32·0 | July 6 | 61·2 | 48·8 | 55·0 | ... | ... | 148·0 | 30·0 | 52·00 | 168 | ... |
| *Auckland* ..... | 85·1 | January 19 | 36·0 | July 23 | 65·2 | 53·3 | 59·3 | 50·8 | 74 | 147·0 | 30·5 | 52·22 | 216 | 6·5 |
| *Falkland Isles* ... | 68·0 | January 28 | 11·8 | June 19 | 47·9 | 36·8 | 42·4 | 38·9 | 85 | 134·0 | 13·6 | 29·39 | 233 | 7·1 |
| Jamaica .. ..... | 93·3 | July 28 | 63·6 | Dec. 10 | 86·8 | 71·5 | 79·2 | 70·7 | 79 | ... | 56·3 | 30·10 | ... | 4·9 |
| Barbados ..... | 86·0 | Aug. 24 & 25 | 66·0 | January 11 | 80·5 | 71·6 | 76·1 | 72·8 | 83 | 154·0 | 62·0 | 68·50 | 194 | 6·0 |
| Toronto ..... | 83·4 | July 4 | —10·5 | February 10 | 50·1 | 33·0 | 41·6 | 36·4 | 76 | 146·4 | —14·5 | 34·13 | 181 | 6·4 |

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## ON THE CLIMATE OF THE BRITISH EMPIRE DURING 1883.

THE accompanying Climatological Table for 1883 is precisely similar in arrangement to that for the preceding year printed in the Magazine for September, 1883, and the stations quoted are the same, but unfortunately the total number has decreased by three. The observations at Winnipeg, which for so many years maintained its unenviable distinction for extreme climate, have been discontinued, and so have those for the somewhat similar station of Sydney, Cape Breton. The place filled heretofore in the summary of extremes by Winnipeg is now occupied by Toronto, which experienced the absolutely lowest temperature in shade, —10°·5; the lowest on grass, —14°·5; the lowest mean daily temperature, and the greatest total range.

The extremes at the other end of the scale are distributed much the same as they were last year. Adelaide again had the highest shade temperature (but it was 109°·5 instead of 112°·0) the highest temperature in sun, and the lowest mean humidity; it also had the greatest mean daily range, which last year occurred at the Cape of Good Hope, the third station which is absent from the table this year. Barbados again appears with the smallest total range (20°) a value precisely similar to that for the preceding year, in fact a comparison of the two tables will show that in almost every element the climate of this station was remarkably similar during the two years, the greatest difference being in the amount of rain. This station also gives the least mean daily range, the value being 0°·6 less than that for Mauritius, which last year had the most equable temperature.

Ceylon again had the highest mean temperature and the greatest rainfall. Falkland Isles was once more the most humid and the most cloudy station, and Bombay the least cloudy.

### SUMMARY.

**Highest temperature in shade, 109°·5, at Adelaide on January 15th.**
**Lowest temperature in shade, —10°·5, at Toronto, February 10th.**
**Greatest range in year, 93°·9, at Toronto.**
**Least range in year, 20°, at Barbados.**
**Greatest mean daily range, 18°·8, at Adelaide.**
**Least mean daily range, 8°·9, at Barbados.**
**Highest mean daily temperature, 80°·7, at Colombo, Ceylon.**
**Lowest mean daily temperature, 41°·6, at Toronto.**
**Driest station, Adelaide; mean humidity, 59.**
**Dampest station, Falkland Isles; mean humidity, 85.**
**Highest temperature in sun, 174°·0, at Adelaide.**
**Lowest temperature on grass, —14°·5, at Toronto.**
**Greatest rainfall, 103·61 inches, at Colombo, Ceylon.**
**Least rainfall, 23·70 inches, at Melbourne.**
**Most cloudy station, Falkland Isles; average amount, 7·1.**
**Least cloudy station, Bombay; average amount, 4·1.**

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEB., 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. | | | | Average. | | | | Absolute. | | TotalRain. | | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | | | | | | | | | |
| | Temp. | Date. | Temp. | Date. | Max. | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth. | Days. | Cloud. |
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 56·3 | 13 | 28·2 | 3 | 48·2 | 37·2 | 37·5 | 85 | 81·7 | 25·0 | 1·40 | 14 | 7·1 |
| Malta | 67·0 | 9 | 41·2 | 23 | 61·2 | 49·2 | 48·6 | 81 | 124·5 | 36·0 | ·67 | 6 | 4·1 |
| *Mauritius* | 85·5 | 6 | 67·9 | 10 | 83·4 | 72·9 | 69·6 | 78 | 137·7 | 63·3 | 3·78 | 18 | 6·2 |
| Calcutta | 87·1 | 28 | 50·0 | 11 | 80·9 | 59·1 | 58·4 | 71 | 147·3 | 50·6 | ·29 | 2 | 2·0 |
| Bombay | 86·1 | 3 | 61·6 | 1 | 81·3 | 67·1 | 64·9 | 71 | 141·0 | 50·1 | ·00 | 0 | 0·9 |
| Ceylon, Colombo | 93·4 | 19 | 68·8 | 4 | 88·0 | 72·1 | 68·2 | 67 | 145·0 | 60·0 | ·90 | 2 | 2·8 |
| *Melbourne* | 100·7 | 13 | 45·0 | 5 | 74·3 | 55·7 | 53·2 | 70 | 158·0 | 38·7 | 1·95 | 9 | 6·4 |
| *Adelaide* | 104·8 | 20 | 47·7 | 27 | 86·4 | 62·3 | 49·9 | 42 | 167·0 | 38·7 | ·12 | 3 | 3·9 |
| *Wellington* | 79·0 | 23 | 44·0 | 10 | 67·7 | 52·3 | ... | ... | 136·0 | 41·0 | 1·29 | 9 | ... |
| *Auckland* | 74·0 | 8 | 48·5 | 10 | 69·2 | 56·8 | 52·3 | 68 | 148·0 | 42·5 | 1·61 | 10 | 6·7 |
| Jamaica | 88·0 | 9 | 62·3 | 7 | 83·6 | 67·0 | 66·4 | 79 | ... | 55·9 | ·11 | ... | 3·3 |
| Barbados | 79·0 | var. | 67·0 | var. | 78·0 | 70·0 | 70·0 | 82 | 141·0 | 64·0 | 1·42 | 8 | 6·0 |
| Toronto | 43·4 | 19 | —7·2 | 29 | 30·7 | 15·7 | 21·2 | 83 | 115·0 | —14·0 | 2·81 | 23 | 8·6 |
| New Brunswick, Fredericton | 46·4 | 14 | —18·0 | 11 | 27·6 | 3·1 | 15·0 | 86 | ... | ... | 5·12 | 17 | 7·3 |
| Minitoba, Winnipeg | 21·8 | 25 | —42·7 | 7 | 2·3 | —29·6 | —8·0 | 95 | ... | ... | 1·34 | 8 | 5·2 |
| British Columbia, Spence's Bridge | 61·0 | 25 | —14·0 | 20 | 22·2 | 5·8 | ... | ... | ... | ... | ·00 | 0 | ... |

### Remarks, February, 1884.

Malta.—Mean temp. 54°·2; mean hourly velocity of wind 8·5 miles, for four hours on the 19th the velocity averaged 31·5 miles; the temp. of the sea varied from 59° to 61°. J. Scoles.

*Mauritius.*—Rainfall 1·62 in., mean temp. 0°·9, and mean hourly velocity of wind 2·1 miles below their respective averages. Prevailing wind E.S.E. to E. by N. T and L on 12 days. TS on 18th with H (a rare thing here), and several houses struck. C. Meldrum, F.R.S.

Colombo.—TSS on 27th, 28th, and 29th. T on 26th. J. H. Symonds.

*Melbourne.*—Mean temp. 1°·9 below average; temp. of dew point, pressure, and rainfall average; humidity 4, and cloud 1·2 above average. Prevailing winds S. and S.W., strong on 3rd, 23rd, and 26th, hot wind on 13th; heavy dew on 4 days, fog on 2 days. R. L. J. Ellery, F.R.S.

*Adelaide.*—Dew deposited on 11 nights—a most unusual number. Bar. remarkably unsteady, and the max. reading 30·441 in., the highest on record in February. Mean temp. average, but hot weather prevailed from 8th to 21st; the max. temp. was above 90° on 15 days, the average number being 10, and the absolute min. was within 0°·2 of the lowest on record. C. Todd.

*Wellington.*—On the whole, fine, bright and warm, with light showers at intervals, at times very warm. Prevailing wind N.W., strong on 4 days. Earthquakes on 1st and 6th. Mean temp. 2°·7 below average; pressure above it. R. B. Gore.

*Auckland.*—Pressure unusually high throughout the month. Mean temp. 4°·6 below the average; rainfall less than half the average. T. F. Cheeseman.

Barbados.—Pressure steady, and slightly below the average. Mean temp. 73°·7, 0°·4 above the average. The wind was N.E., except for part of one day; average velocity 13·6 miles, extremes 20 miles, and 4·7 miles. Rainfall below the average; evaporation 30 per cent. above the average; only one day overcast. R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·74 | XI. | Carno, Tybrith ... ..... | 3·05 |
| ,, | Margate, Birchington... | 4·80 | ,, | Corwen, Rhug ..... | 1·88 |
| ,, | Littlehampton ..... | 3·94 | ,, | Port Madoc ..... | 6·87 |
| ,, | Hailsham ..... | 4·42 | ,, | I. of Man, Douglas ..... | ... |
| ,, | I. of W., St. Lawrence. | 3·25 | XII. | Stoneykirk, Ardwell Ho. | 2·66 |
| ,, | Alton, Ashdell..... | 2·57 | ,, | Melrose, Abbey Gate... | 3·06 |
| III. | Winslow, Addington ... | 1·35 | XIII. | N. Esk Res. [Penicuick] | 2·70 |
| ,, | Oxford, Magdalen Col... | 1·36 | XIV. | Ayr, Cassillis House ... | 4·46 |
| ,, | Northampton ..... | 1·14 | ,, | Glasgow, Queen's Park. | 2·29 |
| ,, | Cambridge, Beech Ho... | 1·60 | XV. | Islay, Gruinart School.. | ... |
| IV. | Southend ..... | ... | XVI. | St. Andrews, Newton Bk | 2·28 |
| ,, | Harlow, Sheering ... .. | 1·59 | ,, | Balquhidder, Stronvar.. | 6·41 |
| ,, | Diss ..... | 3·44 | ,, | Dunkeld, Inver Braan.. | 2·66 |
| ,, | Swaffham ..... | 2·13 | ,, | Dalnaspidal H.R.S. ... | 5·48 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | ·57 |
| V. | Salisbury, Alderbury... | 1·32 | ,, | Forres H.R.S. ..... ... | ·54 |
| ,, | Warminster ..... | 1·56 | XVIII. | Strome Ferry H.R.S.... | 5·29 |
| ,, | Calne, Compton Bassett | 1·91 | ,, | Lochbroom ..... | 4·24 |
| ,, | Ashburton, Holne Vic.. | 3·11 | ,, | Tain, Springfield..... | ... |
| ,, | Holsworthy, Clawton... | 2·30 | ,, | Loch Shiel, Glenaladale | 9·33 |
| ,, | Lynmouth, Glenthorne. | 1·92 | ,, | Invergarry ..... | 5·79 |
| ,, | Probus, Lamellyn ..... | 2·58 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Wincanton, Stowell Rec. | 1·91 | ,, | Forsinard H.R.S. ..... | 1·49 |
| ,, | Taunton, Fullands ..... | 1·39 | ,, | Watten H.R.S. ..... | ·85 |
| VI. | Bristol, Clifton ..... .. | 2·00 | XX. | Dunmanway, Coolkelure | 5·88 |
| ,, | Ross ..... | 1·24 | ,, | Fermoy, Gas Works ... | 2·26 |
| ,, | Wem, Sansaw Hall..... | 1·44 | ,, | Tralee, Castlemorris ... | 2·76 |
| ,, | Cheadle, The Heath Ho. | 2·41 | ,, | Tipperary, Henry Street | 2·04 |
| ,, | Worcester, Diglis Lock | 1·30 | ,, | Newcastle West ..... | 3·09 |
| ,, | Coventry, Coundon ..... | 1·02 | ,, | Miltown Malbay..... | 3·94 |
| VII. | Melton, Coston ..... | ·98 | ,, | Corofin ..... | ... |
| ,, | Ketton Hall [Stamford] | 1·33 | XXI. | Carlow, Browne's Hill.. | 2·12 |
| ,, | Horncastle, Bucknall ... | 1·22 | ,, | Navan, Balrath ..... | 1·55 |
| ,, | Mansfield, St. John's St. | 1·18 | ,, | Mullingar, Belvedere ... | 2·92 |
| VIII. | Macclesfield, The Park. | 4·18 | ,, | Athlone, Twyford ..... | 2·27 |
| ,, | Walton-on-the-Hill..... | 2·62 | XXII. | Galway, Queen's Col.... | 2·68 |
| ,, | Lancaster, South Road. | 3·87 | ,, | Clifden, Kylemore ..... | 7·97 |
| ,, | Broughton-in-Furness .. | ... | ,, | Crossmolina, Enniscoe.. | ... |
| IX. | Wakefield, Stanley Vic. | ·74 | ,, | Carrick-on-Shannon ... | 2·81 |
| ,, | Ripon, Mickley ..... | 1·39 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 1·30 | ,, | Rockcorry..... | 2·60 |
| ,, | East Layton [Darlington] | 1·56 | ,, | Warrenpoint ..... | 2·25 |
| ,, | Middleton, Mickleton .. | 2·11 | ,, | Newtownards ..... | 2·13 |
| X. | Haltwhistle, Unthank.. | 2·44 | ,, | Belfast, New Barnsley . | 3·43 |
| ,, | Shap, Copy Hill ..... | 5·40 | ,, | Cushendun ..... | 4·23 |
| XI, | Llanfrechfa Grange ..... | 2·05 | ,, | Bushmills ..... ..... | 4·53 |
| ,, | Llandovery ..... | 4·99 | ,, | Stewartstown ..... | 3·30 |
| ,, | Lower Solva ..... | 2·26 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 2·81 | ,, | Buncrana ..... | 3·40 |
| ,, | Rhayader, Nantgwillt.. | 4·48 | ,, | Carndonagh ..... | 3·68 |

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# SEPTEMBER, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·77 | — ·73 | ·57 | 3 | 15 | 81·5 | 18 | 40·6 | 30 | 0 | 0 |
| II. | | Maidstone (Hunton Court)... | 3·52 | + 1·21 | 1·36 | 3 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | ... | ... | ... | ... | ... | 82·0 | 17 | 39·0 | 25 | 0 | 0 |
| III. | | Hitchin ..... | 2·00 | — ·48 | ·88 | 3 | 12 | 76·0 | 17 | 36·0 | 29 | 0 | ... |
| ,, | | Banbury ..... | 1·21 | — 1·60 | ·39 | 21 | 11 | 78·0 | 17 | 36·0 | 30 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·49 | — ·29 | 1·12 | 5 | 12 | 76·0 | 17 | 32·0 | 29 | 1 | ... |
| ,, | | Norwich (Cossey) ..... | 2·69 | — ·89 | 1·43 | 4 | 14 | 76·5 | 16 | 35·0 | 30 | 0 | 1 |
| V. | | Weymouth(LangtonHerring) | 1·27 | ... | ·29 | 21 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 2·24 | — 2·04 | ·31 | 21 | 18 | 78·5 | 19 | 46·0 | 27 | 0 | ... |
| ,, | | Bodmin ..... | 2·71 | — 2·53 | ·87 | 15 | 18 | 76·0 | 17 | 42·0 | 30 | 0 | 0 |
| VI. | | Cirencester ..... | 1·36 | — 1·78 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 1·39 | — 2·08 | ·33 | 6 | 14 | 71·5 | 17 | 45·0 | 22*d* | 0 | 0 |
| ,, | | Tenbury (Orleton) ..... | 2·07 | — 1·28 | ·86 | 21 | 13 | 79·8 | 17 | 32·0 | 30 | 1 | 1 |
| VII. | | Leicester ..... | 1·30 | ... | ·25 | 6 | 13 | 83·5 | 17 | 34·9 | 30 | 0 | 3 |
| ,, | | Boston ..... | 1·34 | — 1·27 | ·31 | 4 | 12 | 75·0 | 16 | 37·0 | 30 | 0 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·15 | — 1·92 | ·26 | 6 | 11 | 72·5 | 16*a* | 41·0 | 30 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·81 | ... | ·26 | 8 | 11 | 82·0 | 17 | 39·0 | 3 | 0 | ... |
| VIII. | | Manchester (Ardwick)..... | 3·01 | — ·76 | ·48 | 6 | 16 | 72·0 | 13*e* | 45·0 | 27*f* | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·21 | — ·87 | 1·06 | 22 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 2·64 | — 2·94 | ·70 | 6 | 18 | 74·0 | 18 | 38·0 | 3 | 0 | ... |
| X. | | North Shields ..... | ·64 | — 1·68 | ·21 | 21 | 13 | 72·2 | 20 | 41·0 | 6 | 0 | 0 |
| ,, | | Borrowdale (Seathwaite)..... | 11·97 | — 1·25 | 1·90 | 30 | 19 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·17 | — 2·63 | ·60 | 21 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·68 | — 1·37 | ·77 | 6 | 15 | 76·4 | 18 | 39·0 | 4, 29 | 0 | ... |
| ,, | | Plinlimmon (Cwmsymlog) ... | 4·99 | ... | 1·03 | 21 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·67 | — 2·08 | ·45 | 6 | 16 | 72·0 | 19 | 46·0 | 4 | 0 | 4 |
| XII. | | Cargen [Dumfries] ..... | 3·39 | — 1·02 | ·78 | 30 | 17 | 73·4 | 17 | 39·6 | 5 | 0 | ... |
| ,, | | Hawick (Wilton Hill)..... | 3·89 | ... | 1·40 | 6 | 13 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 3·18 | — 1·22 | ·75 | 6 | 16 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·87 | + ·11 | ·84 | 28 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 5·61 | ... | 1·06 | 30 | 18 | 79·0 | 15 | 42·0 | 1 | 0 | ... |
| ,, | | Mull (Quinish)..... | 4·41 | ... | ·53 | 30 | 20 | ... | ... | ... | ... | ... | ... |
| XVI. | SCOTLAND. | Loch Leven Sluices ..... | 2·50 | — ·73 | ·90 | 29 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·68 | — 1·39 | ·53 | 6 | 13 | 66·0 | 9,10 | 40·0 | 6 | 0 | ... |
| XVII. | | Braemar ..... | 1·93 | — 2·01 | ·35 | 6, 30 | 15 | 68·2 | 12 | 27·0 | 5 | 2 | 5 |
| ,, | | Aberdeen ..... | 1·50 | ... | ·38 | 6 | 15 | 70·0 | 20 | 37·0 | 3 | 0 | ... |
| XVIII | | Skye (Sligachan) ..... | 15·26 | ... | 3·70 | 30 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | ·74 | — 2·16 | ·26 | 30 | 4 | 75·0 | 11 | 37·0 | 4 | 0 | 2 |
| XIX. | | Dunrobin ..... | ·93 | ... | ·20 | 28 | 9 | 70·0 | 11 | 41·0 | 1 | 0 | ... |
| ,, | | Orkney (Sandwick)..... | 1·69 | — 1·80 | ·33 | 24 | 16 | 67·5 | 10 | 44·9 | 29 | 0 | 0 |
| XX. | | Cork (Blackrock) ..... | 2·07 | — 2·08 | ·62 | 15 | 16 | 80·0 | 18*b* | 37·0 | 2 | 0 | ... |
| ,, | | Dromore Castle ..... | 2·79 | ... | ·80 | 9 | 13 | 71·0 | 21 | 44·0 | 29 | 0 | ... |
| ,, | | Waterford (Brook Lodge) ... | 2·08 | ... | ·29 | 25 | 15 | 75·5 | 17 | 36·0 | 3 | 0 | 3 |
| ,, | | Killaloe ..... | 3·15 | ... | ·50 | 6, 7 | 17 | 74·0 | 18*b* | 40·0 | 2 | 0 | ... |
| XXI. | IRELAND. | Portarlington ..... | 1·97 | — 1·21 | ·42 | 7 | 19 | 74·0 | 19 | 41·0 | 2 | 0 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·21 | — 1·20 | ·31 | 7 | 14 | 73·7 | 9 | 45·1 | 5 | 0 | ... |
| XXII. | | Ballinasloe ..... | 2·31 | — 1·65 | ·36 | 7 | 20 | 69·0 | 19 | 40·0 | 5 | 0 | ... |
| XXIII | | Waringstown ..... | 2·73 | — ·62 | 1·20 | 6 | 16 | 76·0 | 10*c* | 40·0 | 2,3 | 0 | ... |
| ,, | | Londonderry (Creggan Res.). | 3·82 | ... | ·96 | 6 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·17 | — ·87 | 1·08 | 6 | 19 | 71·0 | 19 | 40·0 | 30 | 0 | ... |

*a* And 17. *b* And 19. *c* And 11, 19. *d* And 23, 30. *e* And 15, 17. *f* And 30.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

BANBURY.—Harvest work was a little hindered in the first week, but the weather afterwards was very favourable, and all crops were well secured. Mean temp., 58°·2; T and L on 2nd and 10th; T on 9th.

CULFORD.—The R in the early part of the month did much to improve the root crops, and to revive the parched up pastures, supplying plenty of food for cattle, which had become very scarce on this light soil.

LANGTON HERRING.—A fine, warm month, favourable for the ingathering of the harvest. From the 9th to the 21st, the weather was very hot; the mean temp. was 2°·7 above the average of the preceding 12 years.

BODMIN.—A remarkably fine month.

WOOLSTASTON.—A pleasant genial month; mean temp. 57°·0.

ORLETON.—A very pleasant month, with much sunshine, and a mean temp. about 1°·3 above the average of 23 years. The middle of the month was very warm, the temp. rising above 70° on 8 days. The bar. was generally high and steady, and the rainfall was less than the average. A sharp storm of L T and R passed over between 10 and 10.30 a.m. on the 21st, and there was a thick fog all the morning. T was heard also on the 2nd and 15th. The first frost of the season occurred on the morning of the 30th. Fog occurred on several mornings; and there was a great gale of wind on the evening of the 6th, and the morning of the 7th.

LEICESTER.—The month was very fine and dry, suitable for the close of harvest, and for the preparation of the land for autumn sowing.

KILLINGHOLME.—The month was remarkably fine, with a very small rainfall. T and L on 21st.

ARDWICK.—There was a considerable change in the weather this month. At the beginning it rained nearly every day; it was fine in the middle, and became wet again towards the end. The temp. also fell considerably. T on 1st and 21st.

NORTH SHIELDS.—T S S on 1st, 2nd, 3rd and 21st.

SEATHWAITE.—From 21st to 30th was very wet (9·37 in. of R falling in the 10 days) and at times stormy. T on 2nd and 21st.

## WALES.

HAVERFORDWEST.—One of the finest Septembers remembered. During the first 8 days the temp. seldom rose above 60° and considerable amounts of R fell, principally at night, the days being mostly fine but cloudy. After the 9th the temp. rose, and on 10 days 70° or upwards was registered. No such late and great heat occurred during the preceding 35 years, though in 1868 the max. for the month was higher, and the weather was similar, but it did not last until such a late date. The max. temp. in September, 1868, was 78°·8, but there were only six days on which 70° was reached. A great fall of temp., and a severe T S occurred on the morning of the 21st, causing damage and loss of life; the storm lasted 90 minutes, and ·30 in. of R fell in 20 minutes.

LLANDUDNO.—A month of splendid weather, the mean temp. being one degree above, and the rainfall much below the average. Though the number of days on which R fell was about the average, the falls were often very slight. There was but little wind, and a fair amount of sunshine. The range of temp., both diurnal and monthly, was considerably below the average, the former being 10°·7, and the latter 26°·0

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## SCOTLAND.

CARGEN.—T and L on 1st; T on 2nd and 6th.

HAWICK.—Very stormy on the 6th, 26th, 27th and 28th; T on the 21st and 23rd. The middle of the month was fine, the latter half very wet. Very stormy and windy on night of 6th.

CRAIGVARREN.—The month was very dry until the 21st, and all early crops were well secured. On the 13th and following days there were gorgeous sunsets with strong colours, resembling those of last year, but pink predominated, and there was considerable refraction. After the 21st, the weather was exceptionally stormy, with heavy R. T and L on 2nd and 29th.

BRAEMAR.—A very excellent month, crops all secured in fine condition; T and L on 2nd; L on 21st.

ABERDEEN.—The month was characterized by fine weather, with the exception of some days of fog and mist. Rainfall nearly two inches below the average. T and L on 2nd and 4th; L on 1st and 21st. Brilliant aurora on 17th.

CULLODEN.—The month was remarkable for the small rainfall and for the long intervals without R. From the 1st to 24th clear, sunny weather prevailed, some days, particularly the 9th, 10th and 11th, being very warm. The weather generally was calm and very favourable for harvesting the crops.

SANDWICK.—The rainfall in September was only about half the average. The temp. was mild, and there was no gale until the 28th, when it blew 50 miles an hour from noon until 2 p.m., so the crops were cut in the finest harvest weather remembered; T on 4th.

## IRELAND.

DROMORE.—A fair month, but there were one or two severe storms.

WATERFORD.—The driest September since 1865, rainfall little more than half the average; most favourable for getting in the harvest.

KILLALOE.—With sufficient rainfall, though rather less than the average, there were many fine warm days, enabling harvest work to be completed in a very satisfactory manner. Mean temp. 57°·5.

DUBLIN.—In keeping with the summer months of 1884, September was in all respects favourable, towards the end, indeed, the weather was somewhat changeable and showery, but in the middle of the month beautiful autumnal or even summerlike weather prevailed. The mean temp. was 56°·9, 1°·8 above the average of 20 years. The rainfall was little more than one half the average for the same period, and in only two Septembers has the fall been smaller. L was seen on the evening of the 1st; solar halos appeared on the 25th and 29th, and a lunar halo on the 7th. There was a bright aurora on the 17th; fog on the 8th, 10th, 11th, 12th, 17th and 19th, and very heavy dews about the middle of the month. The mean humidity was 83, and the mean amount of cloud, 4·8; prevailing wind westerly.

WARINGSTOWN.—A very fine month with temp. above 70° on 9 days. On the whole this has been the most favourable harvest time for very many years. Grain yielding well, though straw somewhat short. Some second crops of hay were saved in good order.

EDENFEL, OMAGH.—With the exception of a few days at the beginning of the month, and the last week, the weather was really magnificent, resulting in a bountiful and well-saved harvest.

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## THE THUNDERSTORMS OF 1884.

(*Concluded from page* 140.)

[NOTE.—The summation of the facts reported for the whole period will be found on pages 155 to 159.]

### TUESDAY, AUGUST 12th—(continued.)

LANARK.

*Blackwood, Stonehouse.*—A horse killed, and another injured.

*Braidwood.*—A brakesman, enployed by the Caledonian Railway Company, struck and stunned.

*Broomfield Terrace, Airdrie.*—L came down the chimney, forced out the stove, and damaged the furniture.

*Carbarns, Wishaw.*—A sheep and a cow killed.

*Dalmacouter Farm, Airdrie.*—Haystack struck and burned.

*Glasgow.*—A girl named Flora Smith was struck in Regent-street and blinded. The steeple of St. Mark's Free Church was struck, cutting away some stone work and shattering the slates. Three men erecting a stack in Swanston-street, Bridgeton, were struck and rendered insensible. A roof at Clyde-place was partly destroyed, and a roof and tower on houses in John Knox street damaged.

*Greenhead Farm, Wishaw.*—Hayrick burned.

*Halestonemuir, Dalserf.*—Two cows killed.

*Larkhall.*—Two cows killed.

*Merryton, Larkhall.*—Haystack set on fire.

*Overtown, Wishaw.*—Horse killed.

*Stonehouse.*—Three houses struck in Kirk-street.

*Sunnyside Railway Station, Coatbridge.*—The chimneys and roof were shattered about 11.15 a.m., the station agent's house sustained considerable damage, the L having passed down the chimney.

*Wellgatehead, Lanark.*—A chimney-top much rent by L, and a number of trees in the neighbourhood shattered.

*Yieldshields, Carluke.*—Hayrick struck and set on fire.

AYR.

*Cambusdoon.*—Several sheep were killed under a tree, where a man had also taken shelter.



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*Chalmerhouses, Irvine.*—Hayrick struck and ignited.

*Eglington Chemical Works.*—Chimney struck.

*Galston Railway Station.*—A telegraph inspector working at the instrument received a shock which paralysed his arm.

*High Grange, Maybole.*—Five sheep killed.

*Hillhouse, Irvine.*—The house of a ploughman was burned.

*Kilmarnock.*—Part of the coping of the chimney of Messrs. Ferguson's mill was thrown down.

*Maybole.*—Chimney stack at shoe factory shattered, and the Parish Church spire greatly damaged.

*Roadside House, Troon.*—L ignited the thatch and the house was burnt to the ground.

*Sandhill House, Troon.*—L struck and entered the house.

*Troon.*—A vessel in the harbour had her topmast carried away.

*Whitletts, Ayr.*—House struck, the grate in one room, and the hearthstone in another, broken.

RENFREW.

*Ardgowan Street, Port Glasgow.*—About 5 p.m. several men were employed on a steel ship in course of construction at Messrs. Russell and Co's. yard, when six of them were struck down and severely injured. They were all much burned about the face, and from one of them the whole inside skin of the mouth was peeled off, another had a mark left on his back as large as a man's hand, and resembling the trunk and branches of a tree.

*Auchenlodmont, Paisley.*—Stack of hay burnt.

*Greenhead Farm, Houston.*—Chimney struck and damaged.

*Johnstone Foundry, Paisley.*—Part of a chimney knocked down.

*Neilston Colliery.*—A man ascending the shaft was struck and considerably injured.

DUMBARTON.

*Warriston, Helensburgh.*—W. Hutchison while working in the vinery was struck by L and rendered insensible for half-an-hour.

STIRLING.

*Banton, Kilsyth.*—A horse was struck and nearly cut in two, and a large block of buildings was rent from top to bottom.

*Curriemyre Farm, Kilsyth.*—A cow was killed.

*Gartness.*—A man killed.

*Kilsyth.*—A large chimney stalk was struck and part of it dislodged. The roof of a house was also much damaged.

*Riskend Farm, Kilsyth.*—Chimney struck and the grate thrown into the room.

*Main Street, Kilsyth.*—Chimney stack struck and the masonry dislodged.

*Royal Bank, Kilsyth.*—Chimney struck, gas pipe fused and gas ignited.

*Twecher, Kilsyth.*—An engine was struck and the boy attending to it severely injured.

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BUTE.

*Portrye Farm, Millport.*—Cow killed.

ARGYLL.

*Inverary.*—The L struck the Established Church, but little damage was done.

CLACKMANNAN.

*Alloa.*—The telegraph instruments at the Post Office and at the North British Railway Station were broken.

*Whins, Alloa.*—A tree struck.

KINROSS.

*Craighead Farm, Fossoway, Kinross.*—A tall plane tree was struck, and a bull, three cows, and five calves sheltering under it killed. A cow a few yards distant was temporarily paralyzed.

*Dowhill, Cleish.*—Four cattle killed.

FIFE.

*Auchtermuchty.*—L struck the waste store of Messrs. Curr & Co., descended the chimney and ignited the waste, greatly alarming two girls in the store.

*Balbegie Woods, Thornton.*—A cow killed.

*Birns, Ladybank.*—Cow killed.

*Carnock, Dunfermline.*—Chimney rent and ceiling damaged.

*Carseknowes, Kettle.*—L struck the roof of a stable and killed a horse inside.

*Cellardyke.*—The steeple of the new Established Church was struck, and a few slates dislodged from the roof. At the Post Office the telegraph instrument was destroyed and some papers were lighted.

*Chapel Green, Elie.*—Chimney at Carrack House struck and some masonry displaced.

*Demperston, Auchtermuchty.*—A large poplar tree struck.

*Freuchie, Ladybank.*—L struck the chimney of a house, passed through a room, melted the gas-pipe and ignited the gas.

*Hahill, Collessie.*—Three cattle killed in a field.

*Jamesfield, Newburgh.*—Farmhouse struck and chimney demolished.

*Kilmaron, Cupar.*—Three cattle killed.

*Kinloch, Cupar.*—Two cattle killed.

*Penitentiary Close, Newburgh.*—Part of the chimney stack thrown down, slates stripped off the roof and some ornaments in the rooms damaged.

*Pitkeirie, Anstruther.*—Hay stack struck and burnt.

*Pittencreich, Cupar.*—A horse killed.

*Rankeilour, Cupar.*—Ox killed.

*Union Bank, Auchtermuchty.*—L struck the chimney, threw down the cans, melted a gas-pipe, and ignited the gas under the top floor.

*West Anstruther.*—House struck, the chimney being shattered.

PERTH.

*Ballunie Farm, Coupar Angus.*—Lightning descended the chimney, and smashed a clock.

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*Bridge of Earn.*—At the path of Condie, a man named William Nicol was killed while gathering sheep; the L seems to have struck his head, and passed through his body.

*Crieff.*—A large tower on a block of buildings in East High-street was struck, and much damaged; and the grate of a dwelling-house in the same neighbourhood was thrown into the middle of the room. A spire, belonging to Messrs. Donaldson, was stripped of slates, and a large oak, believed to be over 500 years old, was shattered.

*Doune.*—The belfry of the Episcopal Church was struck by L, but very little damage was done.

*Maderty, Crieff.*—A horse killed, and a haystack burnt.

*Perth.*—Part of a building in course of alteration collapsed—struck, it is believed, by L—and injured four men.

FORFAR.

*Andover Hill, Brechin.*—The tower of Smith's Schools damaged.

*Baldovie Farm, Kirriemuir.*—A calf killed.

*Balownie, Stracathro, Brechin.*—Chimney struck.

*Brechin.*—Smart's Factory struck.

*Broughty Ferry.*—Mr. J. Bremner, residing in Brook-street, was struck by the electric fluid, which is supposed to have travelled into the room by means of a telephone wire. Several persons in the street were struck and stunned, but none seriously injured. A barque lying in the river had the top of her mast shattered. At West Ferry a house was struck, the L descending the chimney, smashed the mantelpiece, and damaged some ornaments; several lamp-posts were knocked down, and two telephone poles damaged. At the Beach two houses were struck, in one the chimney was damaged, in the other the gaspipe melted, and the gas lighted.

*Carnoustie.*—The wife and family of J. Tosh were in a neighbour's house when it was struck, the woman had her face burned, and a boy was rendered insensible; several other houses were struck and damaged. A guard applying the brake to a goods train at the station received a shock, his arms being paralysed for a few minutes.

*Dalhestnie, Edzell.*—A horse killed.

*Douglas, Bleachfield, Dundee.*—Manager's house struck, roof and chimneys damaged, and two grates driven into the rooms.

*Fairmuir, Dundee.*—L struck the chimney and part of the stack was thrown down.

*Forfar.*—Two houses struck, but no one injured.

*Haugmuir, Brechin.*—Three cattle killed.

*Kincraig, Brechin.*—Bullock killed.

*Lochee, Dundee.*—A fire ball burst near the bakehouse of Mr. Rollo, a stable near was stripped of slates, a window was broken, and two men in the bakehouse experienced violent shocks.

*Loch of Liff, Carnoustie.*—Two cattle killed.

*Muirhead of Liff, Carnoustie.*—Three cattle killed.

*Rosewell, Carnoustie.*—L entered by the chimney, destroyed a time-

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piece and other articles, and so frightened a young woman that she required medical treatment.

*Union Street, Arbroath.*—Slates dislodged from a house.

*West March, Muirhead of Liff.*—L struck the kitchen chimney, dislodged a grate, and killed a calf in the byre near at hand.

*Whitehills, Forfar.*—Two houses struck, a chimney damaged, a coping-stone thrown down, and slates dislodged.

ABERDEEN.

*Glenmuick, Ballater.*—Coach-house struck, and much of the roof torn off.

*Upper Deeside.*—Huge balls of fire were seen rolling down the slopes of Lochnagar; and several farm buildings were struck by L.

IRELAND.

DOWN.

*Ballyward, Castlewellan.*—Two men struck dead.

*Waterask, Dundrum.*—Three cows and a horse killed.

Between *Newcastle* and *Annalong* four cows were killed.

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**MONDAY, SEPT. 1st.**

YORK.

*Silsden, Skipton.*—A farmer was fetching his cattle home, when he was struck by L and killed; two children with him were uninjured.

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**TUESDAY, SEPT. 2nd.**

GLOUCESTER.

*Malswick, Newent.*—An oak tree under which a cow was sheltering was struck, and the cow instantly killed.

*Oakle Farm, Newent.*—Two heifers killed by L.

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**WEDNESDAY, SEPT. 3rd.**

PERTH.

*Dalguise Station, Dunkeld.*—The station agent, Mr. Geddes, was operating the telegraph instrument, when he received a shock which temporarily paralyzed his arm, side, and leg.

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**THURSDAY, SEPT. 4th.**

ARGYLL.

*Lochgair, Lochgilphead.*—Shortly after three o'clock the L killed three cows at pasture, and upwards of a score of sheep on the hill.

PERTH.

*Fernbank House, New Scone.*—About three o'clock L struck the chimney and knocked down the can, and a few minutes afterwards the western wall was shattered and the building set on fire.

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ORKNEY.

*Knochall, Stromness.*—A young woman in a field was killed. The L struck her on the head, her clothes were burned and torn, and her boots wrenched off, but a watch in her pocket was not stopped.

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## SUNDAY, SEPT. 21st.

LINCOLNSHIRE.

*Sleaford.*—The church clock and spire were struck during service. A fodder stack in the neighbourhood was set on fire.

*Worlaby Top, Brigg.*—Wheat stack struck and consumed.

NOTTINGHAMSHIRE.

*Dunham-on-Trent.*—A large clover rick destroyed.

*St. Bartholomew Stile, Nottingham.*—Two cows in a field killed.

DERBYSHIRE.

*New Mills, Glossop.*—The Roman Catholic Church of St. Mary was struck by L; much damage was done to the tower, and several large stones broke through the roof.

LANCASHIRE.

*Widnes.*—At Kaludah-terrace the L struck a chimney, and passed through a bed-room and a drawing-room; in the bed-room the mantelpiece was shattered, and the grate forced into the room; in the drawing-room the mantelpiece and grate were thrown into the room, the gasalier demolished, and the furniture damaged. The occupant of the house was knocked down and rendered insensible, and his two daughters were stunned. At another house a girl was thrown against a wall and hurt. In Waterloo-road the L passed through the roof of a house dislodging some slates, and a woman in the house was stunned.

YORKSHIRE.

*Asenby, Thirsk.*—Heifer killed.

*Dishforth, Thirsk.*—Two sheep killed.

*Eldmire Hill, Thirsk.*—Two sheep killed.

*Flamborough.*—A horse standing under a shed at the North Star Temperance Hotel, was struck dead.

*Helperthorpe, Great Driffield.*—A large oat stack set on fire by L. Two men in a shed near were struck and knocked off their seats, but not seriously injured. This is the second time this summer that this exposed farm has been struck.

*Howe Hill Lane, Thirsk.*—Implement shed shivered.

*Hull.*—A chimney stack belonging to two houses in Albany-terrace, Anlaby-road, was struck, and the débris falling through the roof did much damage in both houses; two children narrowly escaped.

*Sessay, Thirsk.*—Large tree struck.

*Topcliffe, Thirsk.*—One sheep killed.

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*Westwood, Beverley.*—Union Mill struck; one sail will have to be replaced.

MONMOUTH.

*Dryburgh Street, Monmouth.*—L passed down the bed-room chimney of a house, pierced the floor and tore out the grate in the room underneath, besides greatly damaging the furniture.

BRECON.

*Penwern Farm, Llanspyddid, Brecon.*—A cow killed.

CARNARVON.

*Snowdon.*—A tourist sheltering in a wooden hut was killed by L, and some reports add that the occupier of the hut was hurt.

## SUMMARY.

We are well aware that in these days it is not easy to induce persons to read through a long list of casualties such as we have at last concluded, but we can assure our readers that there are many cases extremely interesting and instructive.

As our Government (unlike those of France and Germany) does nothing towards the registration of damage by lightning, we have made an effort in that direction this year. But it is utterly unreasonable to expect such work to be done by private effort, and we are certain that our list is very imperfect; as regards minor accidents, injury to trees, to sheep, and to cattle it is probably less than half the truth. Doubtless further information might have been obtained from the Agricultural Insurance Companies, but the compilation of such a list is not our duty, and it ought to be done officially as in other countries. However, we have done what time allowed, and the results are important, and probably unexpected.

**Damage Done.**—The table on page 156 gives an analysis of most of the injuries, but not of all, as several did not render themselves readily to classification.

In preparing to compile this table, a difficulty arose from the occasional employment of vague terms. Sometimes a plural is used with no index number, *e.g.*, "sheep were struck;" in other places it is "some sheep," and "several sheep," and "many sheep." Nothing could be done in the way of compiling a tabular summary without adopting some definition, and therefore a plural by itself, or with "some" prefixed, has been taken as the lowest value, "several" as half as many again as "some," and "many" as about twice "some." But the "some" itself is variable; "some" horses probably represents fewer than "some" sheep, so that the final result became rather complicated, and had to be worked out into a table, giving the numerical value to be adopted for every vague expression according to the nature of the object. It is not worth while to print the table, but it may be mentioned that the numbers have been kept as low as possible. "Some" was usually

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taken as 2 or 3, and only with one object as high as 6; "several" generally as 3 or 4, never more than 9; and "many" usually as 5 or 6, never as more than a dozen.

The final totals are large; 35 men killed and 91 injured is a sad beginning to the list, and one to which no money value can be assigned. But as regards the other items, we have tried to form an approximate estimate, a very wild one we admit, but one in which we have tried to keep the amounts low, and in which probably errors will neutralize each other. Leaving the people out of the calculation entirely, the damage recorded comes to nearly £10,000, and had all damage been reported and proper records kept of the values, we have no doubt that it would be nearer £30,000 than £10,000.

*Tabular Analysis of Damage by Lightning, July—Sept.*, 1884.

| Date. | MEN. | | HORSES. | | CATTLE. | | SHEEP. | | | | | STACKS. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Dogs. | Pigs. | Trees. | Destroyed. | Struck. | Churches. | Houses. | Cottages. | Barns & Sheds. | Chimneys. | Factories. |
| July 4 | 5 | 8 | 10 | 4 | 42 | 5 | 75 | ... | ... | ... | 27 | 3 | 6 | 1 | 17 | 2 | 2 | 8 | ... |
| ,, 5 | 2 | 7 | 3 | ... | 6 | ... | ... | ... | ... | ... | 6 | ... | ... | 1 | 5 | 1 | ... | ... | ... |
| ,, 6 | 1 | 1 | ... | ... | 14 | ... | ... | ... | ... | ... | ... | ... | 1 | 1 | 1 | ... | ... | 1 | ... |
| ,, 8 | ... | 3 | 1 | ... | 3 | ... | 5 | ... | ... | .. | 3 | ... | ... | ... | 2 | 1 | ... | 2 | 2 |
| ,, 9 | 5 | 14 | 2 | ... | 20 | 1 | 58 | ... | ... | 2 | 6 | ... | 2 | 1 | 5 | 1 | 1 | 1 | 1 |
| ,, 10 | ... | 2 | ... | ... | ... | ... | ... | ... | . | ... | ... | ... | ... | ... | 1 | 1 | ... | ... | ... |
| ,, 12 | ... | ... | 2 | ... | ... | .. | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, 24 | 1 | 2 | 3 | 2 | 12 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, 25 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | ... |
| ,, 26 | 3 | ... | ... | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Aug. 9 | 5 | 5 | 1 | 1 | 5 | ... | 4 | ... | ... | 1 | 8 | 1 | 1 | 1 | 24 | ... | 6 | 2 | 2 |
| ,, 10 | ... | ... | ... | ... | 1 | ... | 8 | ... | ... | ... | ... | ... | ... | ... | 2 | ... | 1 | ... | ... |
| ,, 11 | 1 | 4 | 1 | ... | 5 | ... | 31 | ... | 1 | ... | 16 | .. | ... | 1 | 5 | 1 | 4 | ... | 1 |
| ,, 12 | 9 | 37 | 20 | 1 | 63 | 7 | 33 | ... | 1 | ... | 14 | 3 | 6 | 10 | 46 | 3 | 6 | 26 | 4 |
| Sept. 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, 2 | ... | ... | ... | ... | 3 | ... | ... | ... | ... | ... | 1 | ... | .. | ... | ... | ... | ... | ... | ... |
| ,, 3 | ... | 1 | ... | ... | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, 4 | 1 | ... | ... | ... | ... | ... | 20 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | 1 | ... |
| ,, 21 | 1 | 7 | 1 | ... | 4 | ... | 5 | ... | ... | ... | 1 | 2 | 2 | 3 | 3 | ... | 1 | 1 | 1* |
| Total | 35 | 91 | 44 | 8 | 181 | 14 | 239 | ... | 2 | 3 | 82 | 14 | 18 | 20 | 112 | 10 | 21 | 42 | 11 |
| Cost of reinstating in £ | | | 1600 | 80 | 2110 | 40 | 420 | ... | 1 | 6 | 164 | 560 | 400 | 600 | 2240 | 100 | 210 | 210 | 220 |

* Windmill.

**Geographical Distribution.**—The first storm period consisted of exactly a week, with an interval of one day; injury occurring on July 4th, 5th, 6th, 8th, 9th and 10th. During this period not one accident is reported from the south-western counties or Wales, in fact not one west of a line drawn from the Isle of Wight to Liverpool, and only two south of the Thames. Another noticeable feature was their

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persistency day after day in Northamptonshire and Warwickshire. It might be imagined that the storms which prevailed over Northampton and Lancashire on the 4th, passed eastwards and became those of Norfolk and East Yorks on the 5th, but we cannot say.

On the 6th little injury was done, and the sites were widely spread, reaching from Loughborough to Dumfriesshire.

On the 8th the Northampton, Warwick and Leicester group reappears, and it is repeated on the 9th with a north-westerly extension, running up to Preston. There are only three accidents reported for the 10th, and not improbably two of those really belong to the previous day.

A fortnight then elapsed without any damage being reported, and on 24th there were but three cases very widely spread, viz., Sussex, Wilts and Nottingham. The entry for 25th from Rutland is uncorroborated, and very possibly should be for the 24th.

After another interval of a fortnight, we have on August 9th a slight storm in Surrey, and damage in nearly every county from Leicester northwards up to the Border, but only at one isolated place in Scotland. On August 10th there was a heavy storm in the N. of Yorkshire, and damage was reported in the Isle of Man.

August 11th was the first date on which damage occurred in Wales; much injury was also done in Yorkshire, and at two places in Scotland.

August 12th.—This was by far the worst storm of the year. Damage was done in London, Essex, Norfolk, Lincoln, York, Durham, Westmoreland, and over all Scotland, except the extreme north; also in the N.E. of Ireland.

After an interval of 19 days, damage was done on September 1st at Skipton, Yorks; on the 2nd in the county of Gloucester; on the 3rd in Perth, and on the 4th in Argyll, Perth and Orkney.

There was then an interval of 17 days, followed by a rather widespread series, including Lincoln, Nottingham, Lancaster, Yorkshire, and Wales, on September 21st.

**Ignition.**—Some years since, evidence that lightning produced fire was asked for. Out of the abundant stock furnished by this article, we quote those instances which seem indisputable. Some evidence apparently strong is not really so, *e.g.*, "Lightning struck a cottage from which all the inhabitants were absent, and in ten minutes it was seen to be in flames." In this case the fire was *not* produced by the lightning, but the embers of a nearly dying-out fire were scattered about the room and ignited clothes hung to dry. Much care is therefore necessary before asserting that a case is indisputable, and we guard ourselves by saying that the following cases *seem* indisputable. In consequence of their number we print them in small type:—

July 4th.—*Aston.*—Two men killed in a field, their clothes completely burned.

" " *Northampton.*—L appeared to strike a metal bedstead, and then to ignite the skirting board against which it stood.

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July 4th.—*Turvey.*—An ash in a hedge was completely stripped and set fire to.
,, ,, *Whittlesea.*—Ricks set on fire.
,, ,, *Willoughby, Lutterworth.*—A ball of fire was observed to strike a stack of clover, to divide it to the centre and to set it on fire.
,, ,, *Crosshills, Yorks.*—A cartload of hay struck and ignited.
* ,, ,, *Carlisle.*—Gas ignited at a house in Blackfriars-street.
,, 6th.—*Goole.*—L struck one end of a clover stack, passed completely through it and entered the ground; shortly afterwards smoke was seen to arise, and the stack was found to be on fire.
,, 9th.—*Bramley, Rotherham.*—Railway station struck and roof ignited.
,, ,, *Howden.*—Some haycocks were ignited.
* ,, ,, *Meltham Mills.*—Lightning passed through the kitchen, melted some gas pipe in the cellar, and ignited the gas.
* ,, 25th.—*Oakham.*—Lightning entered the church and ignited the gas

Aug. 9th.—*Chertsey.*—Rick struck and burnt.
,, ,, *Rochdale.*—Petroleum works set on fire.
,, ,, *Beverley.*—Haystack set on fire.
* ,, ,, *Stockton.*—Lightning struck a house in Finkle-street, fused a gas pipe, and set the premises on fire.
,, 10th.—*Moorhouses, Pateley Bridge.*—Barn struck and set on fire.
,, 11th.—*Glenrinnes.*—Church struck and [roof] set on fire.
,, 12th.—*Honing, Norfolk.*—Stack of hay burnt.
,, ,, *Worstead.*—Two stacks of hay ignited.
,, ,, *Scarborough.*—Stack fired by lightning.
* ,, ,, *Wigtown.*—Lightning struck the chimney of Rochdale House, split it, entered the kitchen, melted the gas pipe, and lighted the gas.
,, ,, *Broomhills, Edinburgh.*—Haystack set on fire and burned; the lightning was seen to roll along the ground for a considerable distance before striking the stack.
* ,, ,, *Edinburgh.*—At the Caledonian station the gas was ignited near the roof.
,, ,, *Newbattle, Edinburgh.*—Haystack set on fire.
* ,, ,, *Leith.*—Gas ignited at a tenement in Mitchell-street.
* ,, ,, *Newhaven.*—Gas ignited at police station.
,, ,, *West Benhar, Linlithgow.*—Two women severely scorched.
,, ,, *Dalmacouter, Lanark.*—Haystack burned.
,, ,, *Greenhead, Wishaw.*—Hayrick burned.
,, ,, *Merryton, Lanark.*—Haystack set on fire.
,, ,, *Yieldshields, Lanark.*—Hayrick set on fire.
,, ,, *Chalmerhouses, Ayr.*—Hayrick ignited.
,, ,, *Troon, Ayr.*—Thatch roof ignited.
,, ,, *Auchenlodmont, Paisley.*—Stack of hay burned.
* ,, ,, *Kilsyth, Stirling.*—Chimney struck, gas pipe fused, and gas ignited.
* ,, ,, *Freuchie, Fife.*—Lightning struck a chimney, passed through a room, melted a gas pipe and ignited the gas.
* ,, ,, *Union Bank, Auchtermuchty.*—Lightning struck the chimney, threw down the cans, melted a gas pipe under the top floor, and ignited the gas.
,, ,, *Pitkeerie, Fife.*—Haystack struck and burned.
,, ,, *Maderty, Crieff.*—Haystack burned.
* ,, ,, *Broughty Ferry.*—Gas pipe melted at Beach, and the gas ignited.

Sept. 4th. - *Stromness, Orkney.*—A woman's clothes burned.
,, 21st.—*Brigg, Lincoln.*—Wheatstack consumed.
,, ,, *Helperthorpe, Yorks.*—Oatstack set on fire.

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Some persons may regard the printing of this list as "slaying the slain," but that is hardly the case; it has often been asserted that lightning is "disruptive" not "heating." Very possibly after the publication of such crushing evidence as the above, we shall hear that "nobody ever disputed it." At any rate, we present the "purely disruptivists" with 44 nuts to crack.

**Lightning and Gas Pipes.**—When the Lightning Rod Conference advised* that lightning conductors should be connected with "the nearest gas *main*, not merely to a lead pipe," there were not a few who regarded the advice as somewhat analogous to putting a lighted torch into a barrel of gunpowder. *There is, however, no instance on record of damage resulting from so doing.* On the other hand, in houses not protected by an efficient conductor, the house gas pipes, being in good connection with miles of mains buried in the streets, become virtually indoor lightning conductors, and are constantly so used by the lightning, as the twelve instances marked with an (*) in the previous table will show; and to them may be added the two following :—

July 4th.—*Kirkcaldy, Fife.*—House struck and gas pipes exploded.
,, 8th.—*Ibstock, Market Bosworth.*—A gas pipe was partly severed.

which do not actually prove ignition. We have thus evidence of damage to gas pipes in fourteen separate cases.

**Kind of Trees.**—Nearly a century ago, Mr. Hugh Maxwell reported to the American Academy that elm, chesnut, oak and pine were often struck, ash rarely, and beech, birch and maple never struck.

In 1860 Mr. Symons, in a paper read at the Oxford Meeting of the British Association, stated that out of 16 trees struck in the years 1857-59, 6 were elms, the others were oak, ash and poplar.

In the present paper we have the species of 18 trees recorded, *viz.*, ash 6, elm 5, oak 4, plane, poplar and willow 1 each.

Therefore the sequence reckoning from the oftenest struck is—

*Maxwell.*—Elm, chesnut, oak, pine . . . . . ash.
*Symons.*—Elm, oak, ash, poplar.
*Met. Mag.*—Ash, elm, oak, plane, poplar, willow.

Of course, the above are miserably small numbers to go upon; for instance, our table reports 82 "trees," but only states the species of 18. It is no more trouble to say that an oak was struck than that an ash was struck, and yet the one is far more interesting and instructive than the other.

* "Report of Lightning Rod Conference." London: E. and F. N. Spon, 1882, p. 19.

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## A TORNADO AT ELY.

*To the Editor of the Meteorological Magazine.*

SIR,—I forward you the accompanying brief account of a small "tornado" experienced last Sunday near Ely. It may be of service to you if you have received no better.

My informant writes from "The Plains," Littleport, Cambs, under date August 31st :—"We have had a sensation here to-day, and while it is fresh in my recollection I must give you an account of it. About 2 p.m., we were visited by a whirlwind of great power and violence, and as we all saw it I am going to describe it as well as my limited abilities permit.

"Since sunrise the morning had been dark with gusts of wind and rain. About noon the rain became very heavy and the wind more fitful. We were at dinner about 1.30, when it again began to pour, but the wind was not very high. In front of us, you remember, there is a wide meadow bordered by the road, from which it is divided by a hedge with large old elms and ash trees. This hedge also bounds the meadow on the left of the house, and runs at right angles from it to the road. Well, about half-past one, as I said before, the rain began again, and continued till nearly two o'clock, when quite suddenly the wind sprang up again with great violence. I was sitting opposite the window when I saw what looked like a pillar of white smoke down to the S.W. It came rapidly across the fen, and caught the stacks just piled in the long ground the other side of the road. Off went the stacks like bundles of straws whirling in all directions, and on came the pillar gyrating across the road. It caught two old elms, and down they came with a crash, split right across their trunks. Then it waltzed across the field, and caught a young larch tree which it whirled and twisted and bent till its branches touched the ground, but the wood being young did not break. Then it moved across to the other hedge, and snap went three more elms; their tops were whirled off into the air, and blown some distance across a stubble field. We rushed to the back of the house, and saw the pillar whirling along across the fen, carrying all before it.

"The strange thing is, that almost instantaneously after it had passed there was an intense stillness. We hurried out as soon as we could to see the damage, and saw the great trees almost stripped of leaves, and lying in the direction of the wind, the ground almost torn up round them.

"It is nearly impossible to describe the sight while it lasted. The air was full of whirling branches, bundles of wheat, leaves, and poor birds. We heard later on that a cow had been blown into the dyke a little further on. The direction of the whirlwind was due N.E."

That is all my correspondent's account, but further particulars could perhaps still be obtained if necessary.

I am, Sir, your obedient servant,

J. HASTINGS WHITE.

*31, Leighton Grove, N. W., 6th Sept., 1884.*

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# SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·29 | XI. | Carno, Tybrith ... ..... | 3·42 |
| ,, | Margate, Birchington... | 3·92 | ,, | Corwen, Rhug ..... | 3·05 |
| ,, | Littlehampton ..... | 1·42 | ,, | Port Madoc ..... | 3·91 |
| ,, | Hailsham ..... | 1·35 | ,, | I. of Man, Douglas ..... | 2·01 |
| ,, | I. of W., St. Lawrence. | 1·32 | XII. | Stoneykirk, Ardwell Ho. | 2·69 |
| ,, | Alton, Ashdell..... | ·86 | ,, | Melrose, Abbey Gate... | 1·59 |
| III. | Winslow, Addington ... | ·89 | XIII. | N. Esk Res. [Penicuick] | 3·20 |
| ,, | Oxford, Magdalen Col... | ·97 | XIV. | Ayr, Cassillis House ... | 4·37 |
| ,, | Northampton ..... | ·80 | ,, | Glasgow, Queen's Park. | 2·95 |
| ,, | Cambridge, Beech Ho... | 1·23 | XV. | Islay, Gruinart School.. | 4·64 |
| IV. | Southend ..... | 1·25 | XVI. | St. Andrews, Newton Bk | 1·67 |
| ,, | Harlow, Sheering ... .. | 1·63 | ,, | Balquhidder, Stronvar.. | 9·33 |
| ,, | Diss ..... | 2·71 | ,, | Dunkeld, Inver Braan.. | 3·17 |
| ,, | Swaffham ..... | 2·69 | ,, | Dalnaspidal H.R.S. ... | 6·96 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 4·35 |
| V. | Salisbury, Alderbury... | ·72 | ,, | Forres H.R.S. ..... ... | 2·80 |
| ,, | Warminster ..... | ·87 | XVIII. | Strome Ferry H.R.S.... | 8·88 |
| ,, | Calne, Compton Bassett | ·91 | ,, | Lochbroom ..... | 6·97 |
| ,, | Ashburton, Holne Vic.. | 1·84 | ,, | Tain, Springfield..... | 2·55 |
| ,, | Holsworthy, Clawton... | 2·99 | ,, | Loch Shiel, Glenaladale | 15·94 |
| ,, | Lynmouth, Glenthorne. | 2·56 | ,, | Invergarry ..... | 8·13 |
| ,, | Probus, Lamellyn ..... | 2·12 | XIX. | Lairg H.R.S. ..... | 5·47 |
| ,, | Wincanton, Stowell Rec. | 1·02 | ,, | Forsinard H.R.S. ..... | 4·21 |
| ,, | Taunton, Fullands ..... | ·46 | ,, | Watten H.R.S. ..... | 4·27 |
| VI. | Bristol, Clifton ..... .. | 1·17 | XX. | Dunmanway, Coolkelure | 4·07 |
| ,, | Ross ..... | 1·05 | ,, | Fermoy, Gas Works ... | 1·54 |
| ,, | Wem, Sansaw Hall..... | 1·02 | ,, | Tralee, Castlemorris ... | 2·99 |
| ,, | Cheadle, The Heath Ho. | 1·51 | ,, | Tipperary, Henry Street | 2·89 |
| ,, | Worcester, Diglis Lock | 1·21 | ,, | Newcastle West ..... | 2·49 |
| ,, | Coventry, Coundon ..... | 1·64 | ,, | Miltown Malbay..... | 4·65 |
| VII. | Melton, Coston ..... | 1·21 | ,, | Corofin ..... | ... |
| ,, | Ketton Hall [Stamford] | 1·00 | XXI. | Carlow, Browne's Hill.. | 1·78 |
| ,, | Horncastle, Bucknall ... | 1·20 | ,, | Navan, Balrath ..... | 1·66 |
| ,, | Mansfield, St. John's St. | ·87 | ,, | Mullingar, Belvedere ... | 2·15 |
| VIII. | Macclesfield, The Park. | 2·26 | ,, | Athlone, Twyford ..... | 2·96 |
| ,, | Walton-on-the-Hill..... | 1·44 | XXII. | Galway, Queen's Col.... | 2·55 |
| ,, | Lancaster, South Road. | 4·11 | ,, | Clifden, Kylemore ..... | 6·09 |
| ,, | Broughton-in-Furness .. | 6·07 | ,, | Crossmolina, Enniscoe.. | 5·01 |
| IX. | Wakefield, Stanley Vic. | ·98 | ,, | Carrick-on-Shannon ... | 3·57 |
| ,, | Ripon, Mickley ..... | 1·75 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 2·08 | ,, | Rockcorry..... | 2·94 |
| ,, | East Layton [Darlington] | 1·23 | ,, | Warrenpoint ..... | 2·30 |
| ,, | Middleton, Mickleton.. | 2·94 | ,, | Newtownards ..... | 1·77 |
| X. | Haltwhistle, Unthank.. | 1·87 | ,, | Belfast, New Barnsley . | 2·97 |
| ,, | Shap, Copy Hill ..... | 2·40 | ,, | Cushendun ..... | 3·96 |
| XI, | Llanfrechfa Grange ..... | 1·10 | ,, | Bushmills ..... ..... | 4·31 |
| ,, | Llandovery ..... | 3·36 | ,, | Stewartstown ..... | 2·86 |
| ,, | Lower Solva ..... | 1·94 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 2·28 | ,, | Buncrana ..... | 4·65 |
| ,, | Rhayader, Nantgwillt.. | 3·93 | ,, | Carndonagh ..... | ... |

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# OCTOBER, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | ·99 | — 1·71 | ·43 | 9 | 10 | 63·9 | 16 | 32·2 | 29 | 0 | 7 |
| II. | | Maidstone (Hunton Court)... | 1·30 | — 1·16 | ·62 | 9 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | ·83 | — 1·91 | ·49 | 9 | 11 | 65·2 | 16 | 24·7 | 30 | 3 | 6 |
| III. | | Hitchin ..... | 1·40 | — ·78 | ·83 | 9 | 10 | 60·0 | 6 | 30·0 | 24 | 3 | ... |
| ,, | | Banbury ..... | ·86 | — 1·90 | ·46 | 9 | 7 | 61·0 | 16 | 30·0 | 29 | 3 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·33 | + ·16 | ·86 | 10 | 12 | 60·0 | 16*b* | 29·0 | 24 | 4 | ... |
| ,, | | Norwich (Cossey) ..... | 3·02 | + ·69 | 2·00 | 10 | 12 | 61·0 | 2, 7 | 28·0 | 25 | 1 | 8 |
| V. | | Weymouth(LangtonHerring) | ·94 | ... | ·33 | 9 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 3·93 | — 1·52 | ·71 | 8 | 20 | 64·0 | 1 | 35·0 | 13 | 0 | ... |
| ,, | | Bodmin ..... | 2·40 | — 3·87 | ·58 | 8 | 20 | 62·0 | 2 | 36·0 | 29 | 0 | 1 |
| VI. | | Cirencester ..... | ·85 | — 2 39 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 1·60 | — 3·00 | ·49 | 9 | 11 | 63·0 | 16 | 33·0 | 11 | 0 | 4 |
| ,, | | Tenbury (Orleton) ..... | 1·05 | — 2·19 | ·37 | 9 | 11 | 65·6 | 16 | 26·8 | 13 | 3 | 8 |
| VII. | | Leicester ..... | 1·52 | ... | ·40 | 9 | 13 | 64·7 | 16 | 31·5 | 5 | 1 | 12 |
| ,, | | Boston ..... | 1·04 | — ·99 | ·23 | 10 | 9 | 62·0 | 16 | 33·0 | 29 | 0 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·38 | — 1·27 | ·23 | 10 | 15 | 61·0 | 18 | 34·0 | 11*g* | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·94 | ... | ·29 | 27 | 12 | 64·0 | 18 | 33·0 | 5, 9 | 0 | ... |
| VIII. | | Manchester (Ardwick)..... | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·26 | — 2·10 | ·32 | 12 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 4·73 | — 2·53 | ·77 | 29 | 18 | 62·0 | 2 | 30·0 | 12 | ... | ... |
| X. | | North Shields ..... | 1·65 | — ·86 | ·65 | 11 | 12 | 61·5 | 16*c* | 29·8 | 11 | 3 | 4 |
| ,, | | Borrowdale (Seathwaite)..... | 10·80 | — 5·75 | 2·03 | 25 | 21 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 1·34 | — 3·89 | ·40 | 8 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 2·53 | — 3·92 | ·50 | 11 | 19 | 61·0 | 1 | 32·0 | 5 | 1 | 2 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 6·07 | ... | ·94 | 27 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·42 | — 3·17 | ·24 | 27 | 18 | 61·8 | 31 | 40·2 | 11 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 1·82 | — 3·89 | ·34 | 2 | 15 | 60·8 | 17 | 28·8 | 11 | 2 | ... |
| ,, | | Hawick (Wilton Hill)..... | ·87 | ... | ·28 | 10 | 9 | ... | ... | ... | .. | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 3·18 | — 1·76 | ·60 | 25 | 17 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 7·18 | — 1·14 | 1·10 | 25 | 22 | ... | ... | 30·0 | 11 | 4 | ... |
| ,, | | Oban (Craigvarren) ..... | 7·03 | ... | 1·10 | 25 | 22 | 60·0 | 6 | 36·0 | 29 | 0 | ... |
| ,, | | Mull (Quinish)..... | 9·14 | ... | 1·32 | 1 | 26 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 3·10 | — 1·21 | 1·00 | 31 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·43 | — 1·44 | ·33 | 11 | 9 | 60·0 | 3*b* | 30·0 | 29 | 1 | ... |
| XVII. | | Braemar ..... | 4·24 | — ·24 | 1·35 | 11 | 17 | 62·0 | 6 | 28·0 | 28 | 5 | 16 |
| ,, | | Aberdeen ..... | 2·69 | ... | ·67 | 10 | 18 | 62·0 | 5*d* | 30·0 | 28 | 2 | ... |
| XVIII | | Skye (Sligachan) ..... | 17·45 | ... | 4·30 | 30 | 26 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 1·70 | — ·59 | ·56 | 27 | 8 | 62·0 | 2 | 31·0 | 29 | 1 | 9 |
| XIX. | | Dunrobin ..... | 4·16 | ... | ·73 | 9 | 18 | 61·5 | 21 | 29·0 | 29 | 2 | ... |
| ,, | | Orkney (Sandwick)..... | 5·40 | + 1·11 | ·86 | 25 | 22 | ... | ... | ... | ... | ... | ... |
| XX. | IRELAND. | Cork (Blackrock) ..... | 1·10 | — 3·64 | ·31 | 23 | 13 | 64·0 | 1*e* | 31·0 | 24 | 1 | ... |
| ,, | | Dromore Castle ..... | 5·10 | ... | ·90 | 27 | 17 | 62·0 | 6 | 31·0 | 28 | 1 | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·25 | ... | ·46 | 23 | 13 | 64·5 | 15*f* | 32·0 | 29 | 1 | 10 |
| ,, | | Killaloe ..... | 3·44 | ... | ·69 | 31 | 20 | 63·0 | 17*c* | 34·0 | 25 | 0 | ... |
| XXI. | | Portarlington ..... | 1·95 | — 1·52 | ·66 | 23 | 19 | 61·5 | 16 | 31·0 | 10 | 1 | ... |
| ,, | | Dublin (FitzWilliam Square) | ·83 | — 2·59 | ·17 | 8 | 14 | 64·5 | 2 | 33·8 | 11 | 0 | 5 |
| XXII. | | Ballinasloe ..... | 2·80 | — 1·63 | 1·02 | 31 | 20 | 60·0 | 2 | 32·0 | 11*h* | 2 | ... |
| XXIII | | Waringstown ..... | 2·55 | — 1·06 | ·40 | 31 | 17 | 64·0 | 5 | 33·0 | 10*i* | 0 | 3 |
| ,, | | Londonderry (Creggan Res.). | 4·65 | ... | ·71 | 31 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 4·52 | + ·20 | 1·10 | 31 | 21 | 62·0 | 6 | 32·0 | 10 | 1 | ... |

*b* And 17, 18. *c* And 18. *d* And 6, 17. *e* And 15, 17, 18. *f* And 16.
*g* And 29. *h* And 25. *i* And 24.
+ Shows that the fall was above the average ; — that it was below it.

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# METEOROLOGICAL NOTES ON OCTOBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Heavy land was too dry for sowing; the clover crop generally was inferior. Autumn tints most beautiful.

BANBURY.—Mean temp. 48°·0, slightly below the average. A fine month, but the dryness of the land interfered with wheat sowing; high winds occurred in the last week. The autumnal tints were wonderfully fine, as the leaves fell but little until the last week, and there was an abundance of hedge fruit, including blackberries, which have been scarce of late years. S on 10th; fog on 6 days.

CULFORD.—The month was most enjoyable, and very favourable for wheat sowing. The second week was wet, but very mild for the season.

LANGTON HERRING.—Another dry month, and scarcity of water is causing considerable inconvenience. Mean temp. about the average; the mean pressure was higher than that of any month since January. There was a noticeable absence of storms. Fresh gale on 26th; lunar halo on 28th.

BODMIN.—A remarkably dry and fine October; mean. temp. 51°·8.

WOOLSTASTON.—The genial temp. of the first few days of the month was succeeded by a week of sharp wintry weather, with occasional storms of S and sleet; after the 14th the temp. rose again, and the remainder of the month was warm and pleasant; mean temp. 48°·3.

ORLETON.—The weather till the 20th, with the exception of a few days from the 8th to the 13th, was generally warm and pleasant, with much sunshine; a high and steady bar. The remainder of the month was frequently cold, with rapid fluctuations of temp. and pressure, and frequent rough winds. On the 11th the Clee hills were covered with S, and a severe frost followed on the morning of the 13th. Rainfall very small; mean temp. about the average of the last 23 years.

LEICESTER.—The month was a dry one, and R is very much needed in this county. A remarkable fall of pressure occurred between the 5th and 9th, the difference between the 9 a.m. readings on the two days being 1·204 in.; this was followed by a fall of S, which, however, soon disappeared.

KILLINGHOLME.—A very fine month, but water scarce. Roses still blooming and dahlias, &c., untouched by frost.

ARNCLIFFE.—Wonderfully dry till the 24th; a wild night on 25th, followed by a period of wet.

SEATHWAITE.—Hills covered with S on 9th; 6·16 in. of R fell in six days, 25th to 30th.

## WALES.

HAVERFORDWEST.—The remarkably fine character of the season continued until the 7th, from which date till the 18th the weather was changeable and wet, and from 9th to 12th stormy. Although R was recorded on 19 days, it generally fell in the early morning, and the days were fine and pleasant, and there was a remarkable absence of frost. Autumnal show of berries, and richly coloured tints in the woods and hedges, the finest ever witnessed. Rainfall the smallest in any October since 1850.

LLANDUDNO.—An unusually dry month, though R fell in measurable quantities on no less than 18 days. The mean temp. was slightly below the average, and the range, both monthly and diurnal, considerably below it. It was rather a dull month, the hours of bright sunshine amounting only to 66.

## SCOTLAND.

CARGEN.—A dull month, and duration of sunshine 30 hours below the average. Temp. average.

HAWICK.—S on the 10th, and very strong gales on the 14th, 25th, and 30th.

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The rest of the month was most genial throughout, and bouquets of single dahlias, sweet peas, mignonette, and many other hardy annuals, could be gathered here at the close.

CRAIGVARREN.—The first part of the month exhibited the usual prevalence of S.E. wind and cloudy sky, but on 10th northerly winds and gales set in with some frost and a general fall of S on the hills. From 25th to the close stormy weather, with constant heavy R and some strong gales prevailed.

QUINISH.—A wet, stormy month; on the whole warm. Wind S.W. to N.W. throughout.

BRAEMAR.—With the exception of snow and sleet on the 10th and 11th, the weather was fine and pleasant.

ABERDEEN.—Good seasonable weather throughout the month. Rainfall somewhat below the average. Strong squalls with sleet on 26th. S gale on the 31st.

CULLODEN.—Very dry weather. R in small quantities fell at long intervals.

## IRELAND.

DROMORE.—The last week of the month was very stormy.

WATERFORD.—Rainfall little more than a quarter of the average. Gales on 9th and 30th. Several small flocks of starlings seen.

DUBLIN.—Although a fine and dry month on the whole, a spell of bitterly cold and wintry weather occurred in the second week, and this was in turn followed by a stormy period towards the close, with sudden and extreme variations of temp. The bar. stood remarkably high on the first few days, the exceptional reading of 30·729 in. being recorded on the 5th. The mean temp. was 49°·1, a value almost identical with the average of 20 years. The rainfall was little more than one-fourth of the average for October, which is usually one of the rainiest months of the year. The total is the smallest of any October in the twenty years 1865-84. H on 10th and 26th. Hoar frost on 11th. Mean humidity 84. Mean amount of cloud 5·7.

EDENFEL.—The month commenced with clear warm weather, but a change occurred suddenly and without warning on 8th, and a period of snow, sleet, and rain accompanied by high winds and night frosts followed. The third week was very fine, the fourth stormy and wet. On the 31st, with a perfectly steady bar., 1·10 in. R fell in 18 hours.

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## ANOTHER HIGH LEVEL STATION.

OUR readers will remember that Mr. Clement Wragge started first a station at Beacon Stoop on the Weaver Hills in Staffordshire, at 1216 ft. above sea, then went north, and started observations on Ben Nevis at 4406 ft. Owing to Mrs. Wragge's health not being good he left Scotland, and went to Adelaide, South Australia. Arrived there, he immediately resumed observations in the plains near Adelaide, and now we learn by the *Adelaide Evening Journal* that he has started a station on Mount Lofty. This mountain is about 2,200 feet high, rising rapidly from the plains at about 10 miles from Adelaide. The station was started on October 1st, and is provided with a Stevenson screen, Richard barograph, a set of thermometers, and a Snowdon rain gauge.

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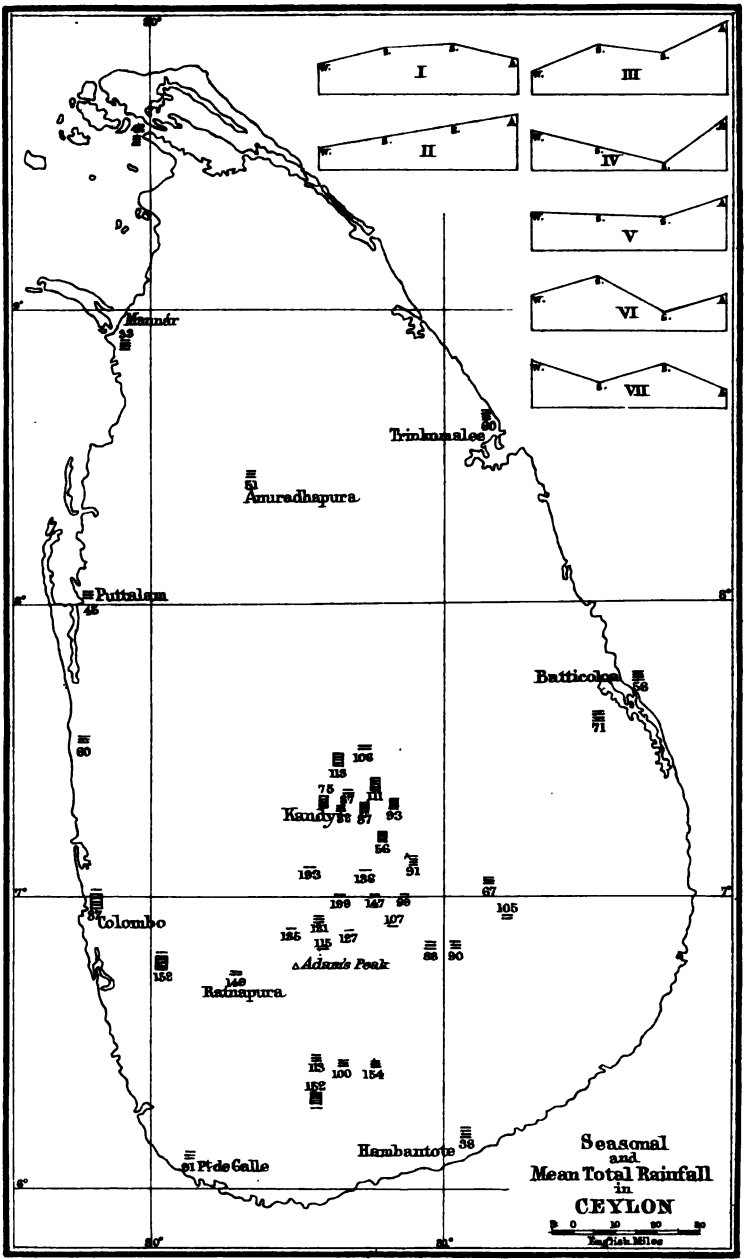


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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXVII.] DECEMBER, 1884. [PRICE FOURPENCE, or 5s. per ann. post free.

## In Memoriam.

CHARLES CLOUSTON, LL.D., L.R.C.S. EDIN.

The number of contributors to *British Rainfall* and to this Magazine is so large that if we were to notice any losses but those of altogether exceptional importance, these pages would become biographical rather than meteorological. The Rev. Dr. Clouston, a descendant of one of the Norwegians by whom the Orkney Isles were chiefly peopled, was born in 1800, was trained for the medical profession and took the degree of L.R.C.S. at Edinburgh in 1819, but on returning to his father's manse at Stromness, he decided upon entering the Church.

The first printed note upon meteorology which we can trace to him was 62 years since, viz., a record of the pocky cloud having been seen on March 5th, 1822, when the barometer fell from 29·5 in. at 10 a.m. to 28·3 in. at 7 p.m. His observations of temperature and wind have been published for every month since 1826. The importance of such a long record, kept in an eminently good position on the west coast of Pomona, in the Orkney Isles, will be evident to everyone, and as far back as 1844 this was recognized by the editors of the *Philosophical Magazine*, who published monthly the daily values from Sandwick, having some years previously (in 1839) published a table by him of Orkney mean temperature. In 1841 we find Mr. Clouston writing the articles on "Sandwick," and on the "Orkney Isles" for Sir J. Sinclair's *New Statistical Account of Scotland*. Passing over shorter papers, we come to one which is the standard authority on Orkney climate, the paper read by Dr. Clouston before the British Association at Aberdeen (when the Prince Consort was president) in 1859, and which was subsequently printed *in extenso* by Admiral FitzRoy in the *Fifth Number of Meteorological Papers*. A year or two later Dr. Clouston wrote a *Guide to the Orkney Islands*, which was printed separately, and also as part of *Anderson's Guide to the Highlands and Islands of Scotland*. And last of all, in 1867, we have *An Explanation of the Popular Weather Prognostics of Scotland on Scientific Principles*.

We ought not to omit to mention that Dr. Clouston was the first



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to describe and explain the formation of "Snow Rollers." This he did in the *Ann. Nat. Hist.* for 1847, and his paper was reprinted in *Silliman's American Journal* for the same year.

Dr. Clouston's contributions to meteorology were, however, of more importance as an observer than as an author. We have already referred to the publication of his observations by the *Edinburgh Philosophical Journal.* He was for many years a corresponding member of La Commission Hydrométrique de Lyon; and his observations were quoted in several of the reports of that body. When in 1856, Dr. Stark laid the foundations of the *Scottish Meteorological Society*, and tables began to be published by the Registrar-General for Scotland, Sandwick was immediately enlisted; when *British Rainfall*, 1860–61, appeared, the Sandwick returns were there; when Admiral FitzRoy wanted a station, at which to erect a large Robinson anemometer, Sandwick was selected. (By the bye, Dr. Clouston was one of the first to point out the evils of placing anemometers on roofs. Admiral FitzRoy sent instructions for the anemometer to be placed on the roof; but when the assistant-in-charge arrived at Sandwick, Dr. Clouston said, "Oh, that won't do; in the first place the wind is so strong that it will tear the roof off, and therefore our heritors won't allow it; and besides that, up above the roof you will get too much wind, you will get that due to the position of the anemometer, and besides that, you will get the wind which, not being able to get through the house, is deflected to the two sides and over the top." Hence it was that the Sandwick anemometer was mounted on the top of an acute pyramidal structure of wood). Thanks to Admiral FitzRoy's judgment, to the continued support of the meteorological office, and to Dr. Clouston's skill and perseverance, meteorology is richer by a series of almost perfect continuous records of the direction and force of the wind on that wild Atlantic shore for 22 consecutive years. The results for 1863–68 have been worked up, and published in the *Quarterly Weather Report* for 1871.

It would be useful to meteorology, and a graceful memorial to Dr. Clouston, if the results of the entire series were worked up, and published by the Meteorological Office.

The University of St. Andrew's conferred upon him the degree of LL.D., but we believe that he was even more pleased at his election as a Member by the Royal Society of Northern Antiquaries of Copenhagen.

In these pages, we have naturally dwelt chiefly upon Dr. Clouston's meteorological work; but he was a thoroughly well-informed man, he was closely associated with Mr. Farrer in the exploration of that archæological enigma, Maes-Howe, he was a good botanist, but beyond all he was an excellent Pastor. For years he was the only medical man in the parish; in fact, he was in 1882 both Minister and Parochial Medical Officer. He was ordained to the ministry in 1826, and his jubilee in 1876 was celebrated with great *éclat*, addresses and testimonials being presented, and a dinner given to him at Kirkwall,

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at which Orcadians "of all shades of opinion" (we quote from the *Orcadian*) assembled to do him honour.

Sandwick Manse was not only a centre of comfort to the parish, it was more than that; we could say much on our own behalf, but we prefer to quote from the leading English scientific journal, *Nature*, and the leading journal in Dr. Clouston's own country, the *Scotsman*:—

"In conclusion, we can only say that a visit to Sandwick was ever a rare treat; the warm hospitality of the Manse, and the interest of the conversation carried on round the table, could not fail to leave an impression which will not easily wear away."—*Nature.*

"Dr. Clouston was a tall, handsome, benevolent, and, of late years, a most venerable looking man. His tastes were cultivated, his home-life refined, his manner stately and courteous, with the old-fashioned dignity. Most distinguished men who went to Orkney, especially if they were scientifically inclined, found their way to Sandwick Manse, where they were always welcomed. A talk of Orkney botany, of Orkney weather, of Orkney customs past and present, a turn to see his full set of meteorological instruments, on which he dilated as on things he loved, a walk to the wild western cliffs and the surging Atlantic, were the incidents of such a visit, and the impressions left on the mind of the visitor were pleasing and enduring. He was, indeed, a man who ministered all his life to his fellow-men in body and mind, who served God, and did his duty."—*Scotsman.*

## HEAVY RAIN IN THE N.W. OF SCOTLAND.

DURING the first half of November, while England generally was suffering from drought, and some of our large towns were still facing the possibility of a water famine, unusually heavy rains were falling over the western highlands of Scotland. At Sligachan, Skye, 6·20 in. fell on the 8th, and at Glenaladale 5·21 in. fell on the same day, but although these amounts are exceptionally large, the observers are so used to heavy rain, that they called forth no special comment. At Oban, however, where *only* 2·65 in. fell, the observer writes:—

"The town was flooded, and people had to be removed from houses on the S. side by boats, roads were torn up on the hill sides and became torrents. Several road bridges were swept away, and others were wholly immersed under the flood. The railway bridge over the Nant, of a span of 60 ft., was wrecked, through the abutment being swept down by the torrent, and altogether such destruction from sudden rainfall has not been known previously within living memory."

The fall of this one day was specially heavy at somewhat irregularly distributed stations, as the following table shows, probably due to the very irregular conformation of the country, but

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it appears strange that Quinish and Kilmory should have registered such comparatively small amounts.

During the first 12 days of the month rain was general over the whole of Scotland, and was very heavy over the west of the country; at the following nine stations, the fall during that period either exceeded 10 per cent. of the mean annual fall, or was greater than the average fall for the whole month.

| STATION. | Rainfall Nov. 1st to 12th. | Per-centage of Mean Annual Fall. | Per-centage of Mean Fall for November. |
|---|---|---|---|
| Gruinart | 5·76 in. | 13 | 112 |
| Kilmory | 5·95 in. | 10 | 111 |
| Stronvar | 6·35 in. | 13? | 150? |
| Oban | 7·04 in. | 11? | 99? |
| Quinish | 8·58 in. | 15 | 124 |
| Dalnaspidal | 6·73 in. | 11 | 99 |
| Glenfinnan | 8·40 in. | 13 | 153 |
| Sligachan | 17·41 in. | 21 | 189 |
| Strome Ferry | 7·62 in. | 12 | 99 |

The values for Stronvar and Oban can be considered only as an approximation, as in both cases, the mean is computed from the fall at two different stations.

The greatest intensity of the downpour occurred between the 4th and 8th, and it has been considered of sufficient importance to justify the insertion of the following table; but at many stations heavy falls occurred also on the 11th and 12th.

| STATION. | COUNTY. | NOVEMBER, 1884. | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 | 5 | 6 | 7 | 8 | Total, 5 days. |
| Cassillis | Ayr | ·34 | ·02 | ·22 | ·20 | 1·28 | 2·06 in. |
| Gruinart | Argyll | ·96 | ·48 | ·41 | ·36 | ·24 | 2·45 ,, |
| Glasgow | Renfrew | ·30 | ·55 | ·60 | ·10 | ·90 | 2·45 ,, |
| Holy Loch | Argyll | ·61 | ·43 | 1·11 | ·56 | 3·23 | 5·94 ,, |
| Kilmory | Argyll | ·64 | ·84 | ·77 | ·40 | 1·22 | 3·87 ,, |
| Stronvar | Perth | 1·64 | 1·09 | ·92 | ·37 | 3·51 | 7·53 ,, |
| Oban | Argyll | ·63 | ·25 | ·51 | ·78 | 2·65 | 4·82 ,, |
| Quinish | Argyll | 1·08 | ·36 | 1·48 | ·82 | 1·09 | 4·83 ,, |
| Dalnaspidal | Perth | 1·40 | ·89 | ·67 | ·54 | 1·32 | 4·82 ,, |
| Glenfinnan | W. Inverness. | 1·85 | ·74 | ·81 | 1·13 | 5·21 | 9·74 ,, |
| Invergarry | W. Inverness. | 1·50 | ·66 | ·40 | ·61 | 2·12 | 5·29 ,, |
| Sligachan | Isle of Skye | 1·86 | 1·00 | ·43 | 2·00 | 6·20 | 11·49 ,, |
| Strome Ferry | W. Ross | ·72 | ·52 | ·32 | ·72 | 2·07 | 4·35 ,, |
| Loch Maddy | W. Inverness. | 1·25 | ·09 | ·53 | ·65 | ·90 | 3·42 ,, |
| Lochbroom | W. Ross | ·35 | ·44 | ·39 | ·66 | ·92 | 2·76 ,, |

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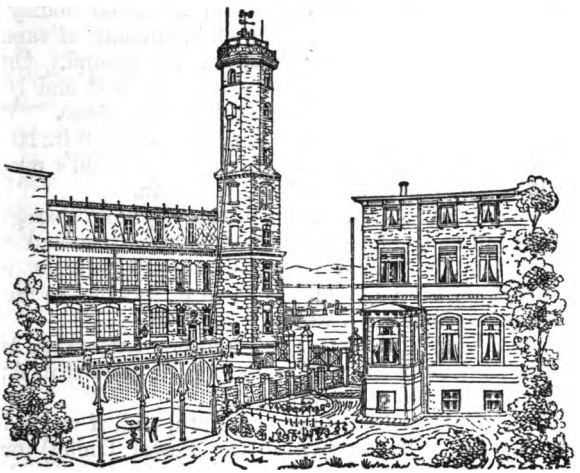
## THE METEOROLOGICAL OBSERVATORY OF THE "MAGDEBURG NEWS."

IN the number of this Magazine for February, 1882 (vol. xvii. p. 10), was given under the title "Newspaper Meteorology," a full account of the equipment and organization, under the direction of Dr. Assmann, of the unique meteorological establishment of the *Magdeburgische*



*Zeitung*. Thanks to the courtesy of Dr. Assmann, we now give an engraving of their lofty (112 ft.) tower, but as regards the instruments and arrangements, we must ask our readers to turn back to the article above quoted, as we, on this occasion, have to deal with the publications of the office.

Some of the methods adopted in order to bring the subject of meteorology before the public at Magdeburg are so original that we cannot refrain from mentioning two of them.

At the principal theatre there is a weather case, which is designed to give the public the earliest information possible as to weather changes. It contains (1) a weather map of the previous day, and extracts from the Journal of the *Magdeburgischen Zeitung* Observatory; (2) a reproduction of the curves of all the self-recording instruments for the previous day; (3) a large scale weather map for that day; (4) the forecast for the next day; (5) reports on the heights of the principal rivers of North Germany.

The next, and a still greater novelty, is the following:—In a niche at the corner of two of the chief streets (Hasselbach and Kaiserstrasse) where there is a capital current of air, a barograph and thermograph by Richard, of Paris, have been placed so that the public may see the records of each instrument in the act of being inscribed. Both instruments work admirably in the open air, and they excite in the public a very remarkable amount of interest.

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As regards the books which have led to this article, we consider the annual volumes in the highest degree creditable; the director claims for the station rank as a "Station of the 1st Order," and substantiates the claim by two handsome quartos,* of about 100 pages each. They are arranged almost precisely upon the plans recommended by the Vienna Conference, but as may be inferred from our previous article, they give much more than is usual. For example, on pages 64 to 69 of the first volume we find *in extenso* hourly records on 1st and 15th of each month of dry bulb, amount of vapour and humidity at 6 ft., 56 ft., and 105 ft. above the ground. On subsequent pages, we have the hygrometric values for 56 ft. and 105 ft., at 8 a.m., 2 p.m., and 8 p.m. every day, printed *in extenso*. We have also earth thermometers, at 0, 2 in., 6 in., 3 ft. 3 in., 9 ft. 10 in., and 16 ft. 5 in. deep; and lastly, the result of a Wild's evaporator, giving for 1882 17·91 in., and for 1883, 19·49 in.

In the volume for 1883, the curves of the "Sprung" barograph are given on their full scale—*i.e.*, $\frac{1}{4}$ inch per hour of time, and 4 inches per inch of barometric change. On this very open scale, it is not remarkable that we have one of the clearest sets of the records of the Krakatoa air waves which we have yet seen.

Dr. Assmann has, however, started another enterprize, and in it seems as successful as in his other efforts. He started in April last a popular Meteorological Magazine.†

It is an 8vo, of about 30 pages per month, and, if we understand aright, will be sent post free (within the Postal Union) for 6s. 3d. per annum. All to whom German type and the German language are no obstacle, would do well to order this interesting periodical.

Perhaps we ought to justify this expression by some quotations, but space is precious. We will quote the contents of the first number, and of a few articles from subsequent ones :—

*Introduction.*

*On Local Weather Forecasting*, by Prof. Boernstein. (This runs through several numbers.)

*The Brownish-red Ring round the Sun*, by A. Grützmacher.

*The Thunderstorm of May* 13, 1884, by Dr. Assmann.

*Survey of the Weather of Central Europe during January*, 1884 (continued for each month in subsequent numbers).

*Notes and Correspondence. Night Frost in May. Snow in May. Budgets for Meteorology in various countries. Action of Oil in diminishing roughness of the Sea.*

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* Jahrbuch der Meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Station I. Ordnung. Herausgegeben von Dr. R. Assmann, Vorsteher. Magdeburg, 1883 and 1884.

† *Das Wetter.* Meteorologische Monatschrift für Gebildete aller Stände. Nos. 1-7. A. & R. Faber, Magdeburg.

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From following numbers we may select:—

*Explanation of the Brownish-red Ring round the Sun*, by Prof. Kiessling.

Prof. Kiessling, of Hamburg, describes the absence of bright blue sky, which has prevailed for many months, and the coloured ring, which is frequently visible round the sun; its diameter being about 25° with the red (a brownish red) outside, then a silverish zone and a violet inside; he describes fully and clearly the phenomena of diffraction, produced by minute particles of vapour and of dust, and states that the identity of the results observed, with those which can be produced experimentally, is such that there can be no doubt that we have to deal with diffraction, though as yet there is no evidence to show whether its source is in particles of vapour or of dust. Simultaneous observations at Flensburg, Hamburg, Magdeburg, and other places, have proved that the matter is higher than the most lofty cirrus.

While upon this subject, we may mention two subsequent kindred notes, viz., *On the abnormal colouring of the sky*, by Prof. Richter, of Salzburg, in which he calls attention to the almost entire absence since December, 1883, of the usual brilliancy in the blue of the sky, and the substitution for it of a milky opaqueness. The other is an extract from the *Gazette de Lausanne*, of August 1st, giving a description of the rings identical with that above quoted from Prof. Kiessling, and indeed with what we see in England, and closing with the enquiry to which the answer has yet to be given—Are these phenomena the sequel of the wonderful optical phenomena seen all over the world last year, and are they due to the eruption of Krakatoa on August 26th, 1883?

We have space on the present occasion only to mention two other articles, each of considerable interest and ability, viz., *On the theories of the Aurora*, by Dr. Hoppe, of Hamburg; and *On the irregularities in the barometer curve during thunderstorms* by Dr. Ciro Ferrari, of Rome.

If *Das Wetter* goes on as it has begun, the meteorologist who ignores it will do so at his peril.

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## DISTRIBUTION OF RAIN IN CEYLON DURING THE DECADE, 1871-80.

By Prof. V. Raulin, *of Bordeaux.*

Ceylon is formed by a mountain mass which occupies the southern portion of the island, and is surrounded by plains which increase its size especially towards the north.

For the period 1871 to 1880 there are 40 stations in the mountain district at which observations were made from 4 to 10 years. But the low lands, though having ten coast stations, have unfortunately only two stations in the interior, Anuradhapura, a little N.W. of the centre of the island, and Ratnapura, in the S.W.

Ceylon offers, in the seasonal distribution of rainfall, a diversity

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of systems greater than, according to my researches, is found in any part of India, except the Madras Presidency and Mysore; a diversity as great as that in Southern France, to which I have called attention in the *Atlas Météorologique de l'Observatoire de Paris, pour* 1869-71, published in 1875, and in my *Observations pluviomètriques de la France méridionale* in 1876.

*Régime* I. (dry winter and wet summer) is only found in the high central circle between Pedrotallagalla (8327 ft.) and Adam's Peak (7415 ft.). Stations 1-9 in table.

*Régime* II. (gradual increase from winter to autumn) prevails only at a few isolated stations near those belonging to *Régime* III. Stations 10—13.

*Régime* III. (winter and summer dry, autumn very wet).—This forms a large zone surrounding *Régime* I. on the S.E., S., W. and N.W., and reaching down to the sea coast at Galle, in the S.S.W., and at Chilaw in the W. Stations 14—26.

*Régime* IV. (winter and autumn very wet, summer very dry) prevails on the N., E., and S.E. coasts, and is also found at the N.E. foot of Pedrotallagalla. Stations 27—33.

*Régime* V. (winter and autumn very wet, spring and autumn rather dry) is found to the N.N.E. of the central mass, at several stations at heights of about 3000 feet. Stations 34—41.

*Régime* VI. (spring very wet, summer dry) is found at three stations in the S.W. Stations 42—44.

We have, therefore, round the highest part of the island, on the one hand at Ramboda (3300 ft.) near its N.W. foot, and at Nuwara Eliya (6240 ft.) at the S. foot, and at the Leangwella Estate (3750 ft.) towards the N.N.E. foot, and at only eight miles distance, the two most opposite *régimes*, viz., I. and IV. In France these two *régimes* never approach within at least eighty miles, and then, as between Thiers (Puy de Dome) and Montpezat (Ardèche) they are separated by the intermediary *régimes* II. and III.—V. RAULIN.

[For the further elucidation of this paper, we have prepared the accompanying map, which itself requires a few words of explanation. Owing to the way in which the rainfall stations are packed together in the higher part of the island, space had to be economized as much as possible. Therefore, the names of the stations are nearly all omitted, but they can be ascertained by referring to the table, the figures given being the mean annual rainfall in inches at the localities over which the figures are placed. Above (in a few cases, to avoid crowding, below) these figures are placed horizontal lines, indicative of the *régime* which Prof. Raulin has assigned to each, therefore $\overline{\overline{\overline{51}}}$ indicates a mean rainfall of 51 inches per annum, falling in accordance with *régime* III.

The series of small diagrams are not to be regarded as quantitively accurate, but merely as indicative of the character of the distribution of each *régime*. The letters denote respectively, Winter, Spring, Summer, Autumn.—ED.]

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# RAINFALL IN CEYLON.

| Stations. | Height | Years. | Winter | Spring | Summ'r | Aut'mn | Year. |
|---|---|---|---|---|---|---|---|
| | | | in. | in. | in. | in. | in. |
| **Régime I. (as at Moulins).—*Dry Winter and Wet Summer.*** | | | | | | | |
| 1. Rungboda Estate | 3300 | 1870–80 (11) | 15·22 | 24·98 | 50·02 | 45·55 | 135·72 |
| 2. Nuwara Eliya | 6240 | 1870–80 (10⅜) | 15·60 | 18·71 | 35·16 | 29·50 | 98·97 |
| 3. Langdale Estate | 4600 | 1868–75 (6⅜) | 10·64 | 16·08 | 44·56 | 36·07 | 107·35 |
| 4. Kabragala Estate | 3750 | 1875–80 (5½) | 13·03 | 42·97 | 82·30 | 54·45 | 192·75 |
| 5. Gingeran Oya | 3850 | 1871–80 (10) | 11·05 | 25·67 | 62·39 | 47·81 | 146·92 |
| 6. Templestove | 4000 | 1872–80 (8¼) | 11·55 | 37·50 | 87·75 | 62·67 | 199·47 |
| 7. Deeside Estate | 4400 | 1873–80 (7¼) | 15·43 | 39·39 | 43·19 | 36·73 | 134·74 |
| 8. Quensland | 4300 | 1873–77 (4¼) | 10·30 | 23·48 | 50·54 | 30·85 | 115·17 |
| 9. Newton Estate | 4000 | 1875–78 (3¾) | 10·45 | 37·52 | 45·13 | 33·66 | 126·76 |
| **Régime II. (as at Lyon).—*Gradual increase from Winter to Autumn.*** | | | | | | | |
| 10. Kandanuwara Estate | 2700 | 1872–80 (8⅜) | 21·83 | 24·14 | 22·48 | 37·95 | 106·40 |
| 11. Pendleton | 2300 | 1870–80 (10¼) | 13·11 | 19·62 | 20·05 | 29·56 | 87·34 |
| 12. Ratnapura | 109 | 1870–80 (11) | 17·78 | 38·33 | 46·25 | 46·84 | 149·20 |
| 13. New Forest | 3500 | 1875–80 (5⅛) | 20·85 | 24·11 | 25·93 | 34·51 | 105·40 |
| **Régime III. (as at Mende).—*Winter and Summer dry, Autumn very wet.*** | | | | | | | |
| 14. Anuradhapura | 312 | 1870–80 (10⅛) | 11·45 | 14·52 | 4·54 | 20·54 | 51·05 |
| 15. Puttalam | 11 | 1869–80 (11) | 9·19 | 14·13 | 2·82 | 18·73 | 44·87 |
| 16. Horakele Estate | 50 | 1870–80 (10⅜) | 8·58 | 18·85 | 10·67 | 21·81 | 59·91 |
| 17. Ettapola Estate | 2500 | 1877–80 (4) | 16·60 | 26·75 | 20·51 | 36·77 | 100·63 |
| 18. Kandy | 1650 | 1870–80 (11) | 15·56 | 16·74 | 20·82 | 28·70 | 81·82 |
| 19. Del Rey, Bagawantalawa | 4300 | 1872–80 (9) | 16·04 | 33·93 | 32·57 | 38·44 | 120·98 |
| 20. Galle | 40 | 1870–80 (11) | 14·35 | 25·92 | 18·97 | 31·53 | 90·77 |
| 21. Springwood Estate | 2250 | 1871–77 (6¼) | 19·05 | 29·20 | 27·09 | 37·86 | 113·20 |
| 22. Vegeriya | 2800 | 1870–80 (9⅜) | 22·51 | 23·25 | 19·59 | 34·92 | 100·27 |
| 23. Nanagalla, Craven Estate | ? | 1874–79 (4½) | 21·33 | 43·95 | 41·74 | 46·48 | 153·50 |
| 24. Wiharagalla | 3100 | 1871–80 (11) | 20·04 | 27·17 | 6·47 | 34·28 | 87·96 |
| 25. West Meeriabedde | 3500 | 1872–80 (8½) | 17·22 | 27·07 | 8·81 | 36·62 | 89·72 |
| 26. Badulla | 2220 | 1870–76 (5½) | 15·99 | 17·98 | 8·33 | 25·09 | 67·39 |
| **Régime IV. (as at Montpellier).—*Winter and Autumn very wet, Summer very dry.*** | | | | | | | |
| 27. Manaar | 12 | 1870–80 (10⅜) | 8·91 | 7·89 | 1·38 | 14·62 | 32·80 |
| 28. Jaffna | 9 | 1871–80 (10) | 9·90 | 6·15 | 2·67 | 23·22 | 41·94 |
| 29. Trincomalee | 175 | 1870–80 (11) | 20·49 | 5·65 | 8·46 | 25·40 | 60·00 |
| 30. Batticaloa | 21 | 1870–80 (11) | 25·06 | 7·02 | 5·19 | 20·53 | 57·80 |
| 31. Rukam | 120 | 1870–80 (10½) | 30·32 | 7·79 | 9·16 | 23·72 | 70·99 |
| 32. Leangwella Estate | 3750 | 1872–80 (8½) | 40·22 | 17·14 | 5·81 | 28·30 | 91·47 |
| 33. Hambantota | 40 | 1870–80 (11) | 9·99 | 7·77 | 5·15 | 14·71 | 37·62 |
| **Régime V. (as at Limoges).—*Winter & Autumn very wet, Spring & Summer rather dry.*** | | | | | | | |
| 34. Matella West | ? | 1869–72 (4) | 16·87 | 14·16 | 17·69 | 34·94 | 83·66 |
| 35. Gammaduwa Estate | 2400 | 1875–80 (5⅜) | 46·33 | 20·57 | 11·96 | 34·27 | 113·13 |
| 36. Sudu Ganga | 1500 | 1870–78 (8⅜) | 18·94 | 16·50 | 14·32 | 25·11 | 74·87 |
| 37. Leangolla Estate | 2800 | 1876–80 (5) | 24·32 | 23·06 | 29·29 | 33·86 | 110·53 |
| 38. Illagala Estate | 3300 | 1870–80 (10½) | 22·52 | 20·19 | 17·02 | 33·73 | 93·46 |
| 39. Nugatenna Estate | 3000 | 1870–80 (5⅛) | 33·32 | 14·21 | 11·75 | 27·39 | 86·67 |
| 40. Upper Rajawella | 1500 | 1870–80 (10½) | 14·12 | 12·50 | 10·38 | 18·78 | 55·78 |
| 41. Gourakelle Estate | 4200 | 1876–80 (4⅜) | 25·88 | 21·73 | 13·79 | 34·85 | 96·25 |
| **Régime VI. (as at Toulouse).—*Spring very wet, Summer dry.*** | | | | | | | |
| 42. Colombo | 40 | 1870–80 (11) | 11·01 | 29·50 | 17·14 | 29·21 | 86·86 |
| 43. Geekianekanda | 200 | 1872–80 (8⅜) | 22·85 | 47·58 | 37·65 | 43·61 | 151·69 |
| 44. Sprinvale Estate | 2200 | 1875–80 (5½) | 17·77 | 46·94 | 41·45 | 46·07 | 152·23 |

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## ROYAL METEOROLOGICAL SOCIETY.

THE first Monthly Meeting of this Society for the present Session was held on Wednesday evening, the 19th instant, at the Institution of Civil Engineers, 25, Great George Street, Westminster, S.W., Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. R. Aitken, N. E. Ballow, M.D., Ph.D., F. C. Bayard, LL.M., G. W. Brenan, A.M.Inst.C.E., H. T. Burls, A. Chadwick, M.D., M.R.C.S., R. Cooke, P. H. Emerson, B.A., M.R.C.S., S. Johnson, M.B., C.M., L.R.C.P., F.R.A.S., G. J. Lee, R. M. Mercer, L. P. Muirhead, J. D. W. Vaughan, and J. B. Wilson, were elected Fellows of the Society.

The following Papers were read :—

(1.) "A new Method of Reading the Direction of the Wind on exposed heights and from a distance," by H. Leupold, F.R.Met.Soc. The author has devised a very ingenious and simple electrical anemograph which records both the direction and velocity of the wind on an ordinary Morse printing telegraph paper.

(2.) "Description of a Component Anemograph," by A. N. Pearson, F.R.Met.Soc.

(3) "On the Injury by Lightning (April 28th, 1884) to the Monument to the first Duke of Sutherland at Lilleshall, Shropshire," by C. C. Walker.

(4.) "On the Mechanical Characteristics of Lightning Strokes," by Col. the Hon. Arthur Parnell. The main objects of this paper were: First, to attempt to show that lightning is not a sort of electric fluid that descends from the clouds, injures buildings and persons in its course, and dissipates itself in the earth, but that it is a luminous manifestation of the explosion caused by two equal forces springing towards each other simultaneously from the earth and the under surface of the inducing cloud, and coalescing or dying out, nearly midway between the two plates of the electrical condenser formed by the earth and the cloud. Secondly, to demonstrate that of these two forces it is the earth-spring, or upward force alone, that injures buildings, persons, or other objects on the earth's surface, and that constitutes tangibly what is rightly known as a lightning stroke. The author gives the details of 278 instances, the records of which he considers demonstrate with more or less precision the existence of an upward direction in the force of the stroke.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1884.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 68·0 | 16 | 27·5 | 1 | 52·7 | 37·5 | 38·6 | 80 | 79·7 | 34·1 | 1·40 | 7 | 6·3 |
| Malta | 69·2 | 1 | 45·8 | 26 | 62·4 | 51·3 | 50·7 | 84 | 127·8 | 41·5 | 1·38 | 8 | 4·5 |
| *Mauritius* | 85·3 | 6 | 69·3 | 14,19 | 82·6 | 72·3 | 70·3 | 81 | 136·6 | 63·0 | 6·75 | 25 | 6·6 |
| Calcutta | 100·2 | 31 | 65·7 | 11 | 93·2 | 71·6 | 68·5 | 68 | 154·1 | 54·8 | 0·06 | 1 | 1·4 |
| Bombay | 89·4 | 30 | 69·8 | 8,9 | 85·2 | 73·0 | 70·0 | 72 | 141·1 | 57·9 | 0·00 | 0 | 1·2 |
| Ceylon, Colombo | 88·7 | 1 | 72·3 | 9,22 | 86·1 | 74·7 | 73·0 | 78 | 142·6 | 62·0 | 3·84 | 10 | 2·9 |
| *Melbourne* | 96·9 | 25 | 37·1 | 17 | 74·5 | 54·4 | 51·7 | 68 | 147·9 | 28·9 | 3·11 | 9 | 5·9 |
| *Adelaide* | 101·6 | 6 | 50·2 | 12 | 83·5 | 60·2 | 48·7 | 44 | 166·9 | 36·6 | 1·74 | 5 | 3·8 |
| *Wellington* | 72·5 | 22 | 45·5 | 25 | 64·3 | 52·8 | ... | ... | 128·0 | 36·0 | 2·44 | 11 | ... |
| *Auckland* | 73·5 | 18 | 50·0 | 25 | 69·0 | 56·3 | 53·0 | 71 | 142·0 | 42·0 | 2·85 | 11 | 5·5 |
| Jamaica | 90·2 | 31 | 63·2 | 22 | 83·7 | 67·5 | 67·8 | 80 | ... | ... | 1·14 | ... | 2·9 |
| Barbados | 79·0 | 1, 31 | 67·0 | var. | 78·0 | 69·0 | 70·4 | 67 | 141·0 | 64·0 | 4·76 | 18 | 6·0 |
| Toronto | 49·3 | 27 | —7·0 | 1 | 35·1 | 20·5 | 23·8 | 77 | 118·0 | —15·0 | 2·53 | 17 | 5·9 |
| New Brunswick, Fredericton | 52·3 | 24 | —12·7 | 5 | 33·9 | 12·4 | 19·8 | 77 | ... | ... | 3·14 | 18 | 5·9 |
| Minitoba, Winnipeg | 37·8 | 26 | —32·7 | 5 | 23·5 | —13·0 | —13·0 | 92 | ... | ... | 1·20 | 5 | 3·7 |
| British Columbia, Spence's Bridge | 63·3 | 22 | 9·2 | 6 | 49·8 | 27·8 | ... | ... | ... | ... | 0·27 | 3 | ... |

### Remarks, March, 1884.

**Malta.**—Mean temp., 55°·9; mean hourly velocity of wind, 11·4 miles. Sea temp. steady at 61°. J. Scoles.

*Mauritius.*—Rainfall 0·70 in., and temp. 1°, below average; mean hourly velocity of wind, 7·9 miles, extremes 18·3 and 0·0 miles. Prevailing direction, S.E. by E. to E.N.E. T and L on 13 days. Colourations of sky before sunrise and after sunset few and faint. C. Meldrum, F.R.S.

**Ceylon.**—TS occurred on 13 days, and T or L alone on 7 days. J. Stoddart.

*Melbourne.*—Mean temp. of air and of dewpoint, each 0°·6 below average; humidity, average; mean pressure and amount of cloud slightly above average; and rainfall ·98 in. above average. Prevailing winds, S. and S.E., generally light. Heavy dews on 8 days. T and L, 25th and 27th; L on 6th. R. L. J. Ellery, F.R.S.

*Adelaide.*—Mean temp. 1° above average; max. above 90° on 8 days. Total rainfall above the average, but only ·05 in. fell before the 28th. Temp. of soil at 5 ft. and 8 ft. more than 1° below the average. Dew on 14 nights. C. Todd.

*Wellington.*—Altogether a pleasant month. Prevailing winds, S.E. and N.W., moderate in force. Slight earthquake on 19th. Mean temp., 3°·7, and rainfall ·40 in. below average. R. B. Gore.

*Auckland.*—Mean temp. unusually low. Rainfall slightly above average; pressure also above average. Heavy TS on 23rd. T. F. Cheeseman.

**Barbados.**—Pressure very unsteady. Mean temp., 1°·4 below average. Prevailing wind, N.E.; average velocity 15·5 miles, extremes 20·5 and 13·3 miles. Rainfall 60 per cent. above the average, and only once exceeded in March during 33 years. Evaporation high, and nearly equal to the rainfall. Three days overcast. R. Bowie Walcott.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 68·4 | 2 | 29·9 | 23* | 54·9 | 37·8 | 37·5 | 74 | 87·6 | 34·2 | 1·02 | 14 | 6·4 |
| Malta | 74·2 | 19 | 50·9 | 2 | 68·7 | 55·5 | 53·2 | 76 | 133·3 | 46·0 | ·34 | 2 | 3·3 |
| *Mauritius* | 82·8 | 1 | 67·3 | 8 | 81·0 | 71·3 | 68·1 | 79 | 136·0 | 59·7 | 6·02 | 17 | 6·6 |
| Calcutta | 103·7 | 14 | 69·2 | 23 | 96·5 | 75·5 | 72·8 | 69 | 157·2 | 62·7 | 1·38 | 4 | 2·6 |
| Bombay | 92·4 | 4 | 73·9 | 14 | 87·5 | 76·4 | 73·1 | 74 | 145·8 | 64·0 | 0·00 | 0 | 2·0 |
| Ceylon, Colombo | 88·5 | 23 | 73·3 | 27† | 86·7 | 75·6 | 73·9 | 79 | 142·3 | 65·0 | 5·35 | 12 | 4·5 |
| *Melbourne* | 88·2 | 2 | 40·7 | 30 | 69·7 | 50·7 | 49·3 | 71 | 138·2 | 34·7 | ·76 | 8 | 5·9 |
| *Adelaide* | 86·0 | 13 | 43·8 | 20 | 71·6 | 54·1 | 47·6 | 58 | 146·0 | 36·6 | 1·34 | 10 | 5·2 |
| *Wellington* | 67·0 | 13 | 39·8 | 11‡ | 60·4 | 48·3 | ... | ... | 121·0 | 36·0 | 2·09 | 6 | ... |
| *Auckland* | 72·0 | 7 | 46·0 | 21 | 65·4 | 53·1 | 49·1 | 69 | 138·0 | 39·0 | 1·21 | 5 | 4·5 |
| Jamaica, Kingston | 89·1 | 28 | 64·7 | 30 | 84·3 | 68·9 | 70·0 | 80 | ... | ... | ·11 | ... | 3·0 |
| Barbados | 81·0 | var. | 67·0 | 15 | 80·0 | 70·0 | 70·1 | 77 | 144·0 | 64·0 | 4·69 | 10 | 5·0 |
| Toronto | 67·8 | 27 | 25·1 | 6,12 | 48·5 | 33·2 | 29·0 | 63 | 123·5 | 16·0 | ·95 | 11 | 6·0 |
| New Brunswick, Fredericton | 66·5 | 24 | 19·9 | 15 | 49·3 | 32·3 | 33·1 | 76 | ... | ... | 3·87 | 18 | 7·5 |
| Manitoba, Winnipeg | 66·0 | 25 | 8·7 | 10 | 42·4 | 23·0 | 33·0 | 78 | ... | ... | 2·69 | 12 | 7·1 |
| British Columbia, Spence's Bridge | 79·3 | 8 | 35·9 | 18 | 66·0 | 42·7 | ... | ... | . | ... | ·10 | 2 | ... |

* And 24. † And 28. ‡ And 25.

### REMARKS, APRIL, 1884.

MALTA.—Mean temp., 61°·0; mean hourly velocity of wind, 11·6 miles; on 28th, velocity averaged 27 miles for 7 hours. Sea temp. rose from 61° to 65°. J. SCOLES.

*Mauritius.*—Rainfall, average; mean temp., 1°·1 below average. Mean hourly velocity of wind equal to average, extremes 27·4 and 2·3 miles; prevailing direction, S.E. to E. L on 7 days, and T on 4 other days. C. MELDRUM, F.R.S.

CEYLON.—TSS or L occurred on every day, but 29th and 30th. J. STODDART.

*Melbourne.*—Mean temp., 0°·3 above, and rainfall 1·51 in. below average. Pressure, temp. of dew point, humidity and amount of cloud, all very near their respective averages. Prevailing winds, S.E. and N., generally moderate; heavy squalls on 24th. Heavy dew on 9 nights. T and L on 14th; L on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure, ·050 above the average of 27 years; the max. reading (30·525 in.) was one of the highest recorded, and the min. (29·513 in.) was only ·008 in. above the lowest on record. Mean temp. (62°·8) unusually low for April. Dew on 16 nights, and the red glow only noticed twice. C. TODD.

*Wellington.*—Showery from 5th to 10th and on 30th, remainder of month fine and bright. L on 16th. Earthquakes on the 11th, 16th and 25th. Mean temp., 2°·8, and rainfall 1·51 in. below their respective averages. R. B. GORE.

*Auckland.*—On the whole a remarkably fine month, with little rain or wind. Pressure unusually high throughout. T. F. CHEESEMAN.

JAMAICA.—The rainfall over the Island generally was only one-half the average; at many places no R fell at all, and at only a few places in the west central districts was there any considerable rainfall. MAXWELL HALL.

BARBADOS.—Pressure fairly steady; mean temp. (74°·2), 1°·1 below average. Prevailing wind, N.E.; mean hourly velocity, 10·6 miles, extremes 14·5 miles and 6·2 miles. Rainfall 47 per cent. above, and evaporation 30 per cent., below their averages. 2·06 in. of R fell on 14th; only 2 days overcast. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·12 | XI. | Carno, Tybrith ... ..... | 3·15 |
| ,, | Margate, Birchington... | 1·28 | ,, | Corwen, Rhug ..... | 3·02 |
| ,, | Littlehampton ..... | 1·11 | ,, | Port Madoc ..... | 4·26 |
| ,, | Hailsham ..... | 1·40 | ,, | I. of Man, Douglas ..... | 4·54 |
| ,, | I. of W., St. Lawrence. | ·50 | XII. | Stoneykirk, Ardwell Ho. | 3·38 |
| ,, | Alton, Ashdell..... | 1·48 | ,, | Melrose, Abbey Gate... | 2·72 |
| III. | Winslow, Addington ... | 1·41 | XIII. | N. Esk Res. [Penicuick] | 2·30 |
| ,, | Oxford, Magdalen Col... | 1·74 | XIV. | Ayr, Cassillis House ... | 3·53 |
| ,, | Northampton ..... | 1·36 | ,, | Glasgow, Queen's Park. | 3·80 |
| ,, | Cambridge, Beech Ho... | 1·13 | XV. | Islay, Gruinart School.. | 6·81 |
| IV. | Southend ..... | ·75 | XVI. | St. Andrews, Newton Bk | 1·78 |
| ,, | Harlow, Sheering ... .. | 1·93 | ,, | Balquhidder, Stronvar.. | 10·08 |
| ,, | Diss ..... | 1·67 | ,, | Dunkeld, Inver Braan.. | 2·96 |
| ,, | Swaffham ..... | 2·37 | ,, | Dalnaspidal H.R.S. ... | 7·59 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 4·05 |
| V. | Salisbury, Alderbury... | 1·92 | ,, | Forres H.R.S. ..... ... | 2·45 |
| ,, | Warminster ..... | 1·85 | XVIII. | Strome Ferry H.R.S.... | 9·89 |
| ,, | Calne, Compton Bassett | 1·71 | ,, | Lochbroom ..... | 8·64 |
| ,, | Ashburton, Holne Vic.. | 3·15 | ,, | Tain, Springfield..... | 3·20 |
| ,, | Holsworthy, Clawton... | 3·17 | ,, | Loch Shiel, Glenaladale | 15·92 |
| ,, | Lynmouth, Glenthorne. | 2·69 | ,, | Invergarry ..... | 9·52 |
| ,, | Probus, Lamellyn ..... | 2·91 | XIX. | Lairg H.R.S. ..... | 4·26 |
| ,, | Wincanton, Stowell Rec. | 1·89 | ,, | Forsinard H.R.S. ..... | 5·29 |
| ,, | Taunton, Fullands ..... | 1·23 | ,, | Watten H.R.S. ..... | 3·61 |
| VI. | Bristol, Clifton ..... .. | 1·69 | XX. | Dunmanway, Coolkelure | 6·43 |
| ,, | Ross ..... | 1·90 | ,, | Fermoy, Gas Works ... | 3·10 |
| ,, | Wem, Sansaw Hall..... | 1·70 | ,, | Tralee, Castlemorris ... | 4·91 |
| ,, | Cheadle, The Heath Ho. | 1·85 | ,, | Tipperary, Henry Street | 2·96 |
| ,, | Worcester, Diglis Lock | 1·82 | ,, | Newcastle West ..... | 3·01 |
| ,, | Coventry, Coundon ..... | 1·74 | ,, | Miltown Malbay..... | 3·75 |
| VII. | Melton, Coston ..... | 1·28 | ,, | Corofin ..... | ... |
| ,, | Ketton Hall [Stamford] | 1·46 | XXI. | Carlow, Browne's Hill.. | 2·13 |
| ,, | Horncastle, Bucknall ... | 1·39 | ,, | Navan, Balrath ..... | 2·16 |
| ,, | Manafield, St. John's St. | 1·62 | ,, | Mullingar, Belvedere ... | 3·12 |
| VIII. | Macclesfield, The Park. | 1·87 | ,, | Athlone, Twyford ..... | 4·58 |
| ,, | Walton-on-the-Hill..... | ... | XXII. | Galway, Queen's Col.... | 4·63 |
| ,, | Lancaster, South Road. | 1·85 | ,, | Clifden, Kylemore ..... | 8·96 |
| ,, | Broughton-in-Furness .. | 2·31 | ,, | Crossmolina, Enniscoe.. | 5·24 |
| IX. | Wakefield, Stanley Vic. | ·85 | ,, | Carrick-on-Shannon ... | 3·93 |
| ,, | Ripon, Mickley ..... | 1·60 | XXIII. | Dowra ..... | ... |
| ,, | Scarborough..... | 2·19 | ,, | Rockcorry..... | 2·50 |
| ,, | East Layton [Darlington] | 1·55 | ,, | Warrenpoint ..... | 2·89 |
| ,, | Middleton, Mickleton.. | 2·37 | ,, | Newtownards ..... | 2·81 |
| X. | Haltwhistle, Unthank.. | 1·72 | ,, | Belfast, New Barnsley.. | 3·51 |
| ,, | Shap, Copy Hill ..... | 4·39 | ,, | Cushendun ..... | 4·88 |
| XI. | Llanfrechfa Grange ..... | 2·71 | ,, | Bushmills ..... ..... | 4·49 |
| ,, | Llandovery ..... | 2·92 | ,, | Stewartstown ..... | 3·10 |
| ,, | Lower Solva ..... | 3·05 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 4·55 | ,, | Buncrana ..... | 5·59 |
| ,, | Rhayader, Nantgwillt.. | 3·27 | ,, | Carndonagh ..... | ... |

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# NOVEMBER, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·92 | — ·52 | ·79 | 30 | 12 | 60·2 | 7 | 25·3 | 25 | 7 | 1 |
| II. | | Maidstone (Hunton Court)... | 1·15 | — 1·75 | ·43 | 21 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 1·49 | — 1·26 | ·42 | 5 | 14 | 60·6 | 5 | 21·2 | 24 | 13 | 2 |
| III. | | Hitchin ..... | 1·92 | — ·69 | ·80 | 30 | 12 | 56·0 | 2 | 22·0 | 24 | 16 | ... |
| ,, | | Banbury ..... | 1·41 | — 1·30 | ·47 | 30 | 11 | 59·0 | 2 | 23·5 | 30 | 14 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·51 | — 1·32 | ·43 | 30 | 14 | 59·0 | 7, 8*a* | 23·0 | 23 | 18 | ... |
| ,, | | Norwich (Cossey) ..... | 2·31 | — 1·00 | ·26 | 20 | 17 | 59·0 | 7 | 23·0 | 30 | 8 | 1 |
| V. | | Weymouth(LangtonHerring) | 1·82 | ... | ·66 | 30 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 3·18 | — ·97 | ·66 | 5 | 20 | 61·0 | 1 | 29·0 | 30 | ... | ... |
| ,, | | Bodmin ..... | 3·20 | — 2·12 | ·48 | 5 | 20 | 57·0 | 5 | 30·0 | 18*e* | 6 | 1 |
| VI. | | Cirencester ..... | 1·65 | — 1·33 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 1·51 | — 1·93 | ·32 | 2 | 19 | 54·0 | 1, 6*b* | 27·0 | 30 | 6 | 1 |
| ,, | | Tenbury (Orleton) ..... | 1·85 | — 1·01 | ·47 | 2 | 15 | 60·2 | 1 | 22·0 | 30 | 11 | 1 |
| VII. | | Leicester ..... | 1·57 | ... | ·36 | 5 | 13 | 59·5 | 2 | 23·5 | 30 | 7 | 2 |
| ,, | | Boston ..... | 1·87 | — ·50 | ·58 | 30 | 13 | 58·0 | 2 | 26·0 | 26 | 6 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·62 | — 1·48 | ·46 | 30 | 17 | 48·5 | 2 | 25·0 | 30 | 5 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·94 | ... | ·40 | 30 | 12 | 60·0 | 1 | 24·0 | 30 | 11 | ... |
| VIII. | | Manchester (Ardwick)..... | 1·66 | — 1·31 | ·38 | 4, 30 | 11 | 55·0 | 6 | 26·0 | 30 | 7 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·19 | — 1·57 | ·42 | 5 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 3·23 | — 2·52 | ·81 | 4 | 17 | 58·0 | 8 | 22·0 | 29 | ... | ... |
| X. | | North Shields ..... | 1·62 | — 1·83 | ·23 | 4 | 17 | 60·0 | 1 | 18·2 | 30 | 7 | 8 |
| ,, | | Borrowdale (Seathwaite)..... | 6·70 | — 5·12 | 1·46 | 1 | 15 | 54·8 | 6 | 22·8 | 30 | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·21 | — 1·99 | ·53 | 30 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·75 | — 1·59 | 1·00 | 29 | 14 | 57·5 | 1 | 25·0 | 25 | 6 | 1 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 3·72 | ... | ·73 | 4 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 2·23 | — 1·68 | ·46 | 28 | 17 | 61·0 | 1 | 29·2 | 30 | 1 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·40 | — 1·51 | ·78 | 6 | 9 | 56·6 | 1 | 21·8 | 30 | 13 | ... |
| ,, | | Hawick (Wilton Hill)..... | 1·64 | ... | ·83 | 4 | 8 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 2·69 | — ·86 | ·89 | 4 | 11 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 6·92 | + 1·56 | 1·22 | 8 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 7·57 | ... | 2·65 | 8 | 16 | 55·5 | 6, 7*c* | 29·0 | 24 | 2 | ... |
| ,, | | Mull (Quinish)..... | 9·52 | ... | 2·05 | 11 | 19 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·90 | — ·65 | ·70 | 9 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·47 | — 1·68 | ·40 | 6 | 7 | 54·0 | 1 | 21·0 | 30 | 7 | ... |
| XVII. | | Braemar ..... | 4·03 | + ·26 | ·66 | 3 | 20 | 52·2 | 1 | 15·4 | 30 | 13 | 24 |
| ,, | | Aberdeen ..... | 3·22 | ... | ·78 | 4 | 20 | 55·0 | 1 | 14·0 | 30 | 8 | ... |
| XVIII | | Skye (Sligachan) ..... | 21·51 | ... | 6·20 | 8 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 2·93 | + ·23 | ·83 | 8 | 7 | 55·0 | 11*d* | 22·0 | 30 | 7 | 22 |
| XIX. | | Dunrobin ..... | 3·63 | ... | 1·24 | 26 | 15 | 55·0 | 1 | 22·5 | 30 | 8 | ... |
| ,, | | Orkney (Sandwick)..... | 3·94 | — ·50 | ·50 | 7 | 23 | 57·8 | 11 | 23·6 | 30 | 3 | 9 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 3·68 | — ·93 | 1·14 | 6 | 14 | 57·0 | 1*c* | 24·0 | 24 | 14 | ... |
| ,, | | Dromore Castle ..... | 2·94 | ... | ·85 | 8 | 11 | 58·0 | 4 | 31·0 | 17 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 2·73 | ... | 1·11 | 6 | 11 | 56·2 | 4 | 28·0 | 25 | 6 | 19 |
| ,, | | Killaloe ..... | 3·98 | ... | 1·06 | 11 | 13 | 58·0 | 12 | 26·0 | 22*f* | ... | ... |
| XXI. | | Portarlington ..... | 2·27 | — ·13 | ·70 | 1 | 19 | 57·0 | 1 | 28·0 | 22 | 13 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·41 | — ·87 | ·55 | 1 | 14 | 58·6 | 1 | 31·1 | 16 | 3 | 19 |
| XXII. | | Ballinasloe ..... | 3·81 | + ·81 | ·84 | 11 | 19 | 54·0 | 1 | 25·0 | 22 | 17 | ... |
| XXIII | | Waringstown ..... | 2·16 | — ·55 | ·48 | 6 | 14 | 57·0 | 11 | 26·0 | 21 | 15 | 21 |
| ,, | | Londonderry (Creggan Res.). | 5·30 | ... | ·95 | 4 | 24 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·75 | + ·70 | ·60 | 11 | 20 | 52·0 | 11 | 27·0 | 13 | 12 | 17 |

*a* And 9. *b* And 7. *c* And 11. *d* And 12. *e* And 25, 30. *f* And 25.
+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The early part of the month was warm and bright; insects were out, and flowers abundant. The last fortnight was cold, with haze by day and frosts by night; land as dry as at Midsummer.

BANBURY.—Mean temp. 42°·0; high wind on 3 days; fog on 2 days; S on 3 days.

CULFORD.—A very changeable month, showers occurring suddenly, but not delaying out-door work.

LANGTON HERRING.—The fourth very dry month in succession, the total rainfall for the four months, August to November inclusive, being only 5·38 in., while the average is 13·80 in. The first 12 days were mild, but the mean temp. is 2°·8 below the average of 12 years. The continued absence of storms was noticeable.

BODMIN.—A remarkably fine month, with little wind, and a rainfall of little more than half the average. Springs lower than they have been at any other time during at least 80 years. Mean temp., 43°·8.

WOOLSTASTON.—The first fortnight was mild and genial, and several primroses were seen in blossom. After the 14th, a cold period set in, with sharp frost at night. S fell on 27th and 30th. Mean temp., 41°·0.

TENBURY.—During the first week R fell daily, and the temp. was high, with the exception of two frosty nights; little R fell afterwards, till the 30th, when a steady fall of S for six hours occurred after a severe frost, covering the ground to a depth of two-and-a-half inches. After the 14th, the temp. was much below the average, with many frosty nights; but the mean for the month was nearly 0°·5 above the average of 23 years; the bar. was generally high and steady. A favourable time for wheat planting on the strong clay lands.

LEICESTER.—The month was very misty, with several sharp frosts and snow on 23rd, 24th and 30th, the fall on the latter day lasting from 2 p.m. until late at night.

KILLINGHOLME.—Scarcity of water seriously felt both in town and country. Three inches of snow on the ground when the month closed, and more was falling.

ARDWICK.—November was a fine, open month; there was comparatively little fog, and little frost. A fall of about three inches of S occurred on the afternoon of the 30th, but it only remained on the ground about 24 hours.

NORTH SHIELDS.—TS on 20th; S on 24th, 29th, and 30th.

## WALES.

HAVERFORDWEST.—An unusually fine dry month. Considerable rainfall during the first 10 days, principally at night; but from 10th to 24th it was fine, with cold days and frosty nights. Towards the end the air was bleak and stormy, with cold R and sleet.

LLANDUDNO.—A mild, but dull month. It began with a high temp., and ended with a snowstorm and slight frost, both of which, however, disappeared the following day. The mean temp. was about half a degree above the average, the total range being slightly above, and the mean daily range slightly below, the average. Duration of bright sunshine only 42 hours.

## SCOTLAND.

CARGEN.—Temp. of the month 1° below, and duration of sunshine 20 hours below the average. L on 4th and 20th; S on 30th.

HAWICK.—A most genial month, with the exception of the last five nights, which were frosty; very windy on 4th, 5th, 6th and 16th; much L at night on 20th.

OBAN.—A remarkable month. The early part was stormy, and on the 8th the heaviest known rainfall (2·65 in.) occurred here and throughout the west coast. The town was flooded, and much damage done. The remainder of the

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month was unusually fair, cold, and calm, with a prevalence of N. winds. H on 2nd, 9th and 28th ; L on 9th ; S on 24th.

QUINISH.—The rainfall of the first 11 days (8·49 in.) is quite unprecedented. The rest of the month was fine with slight frosts.

ABERDEEN.—Rainfall exactly the average. Till the 17th, the prevailing winds were S. to S.W., with showery weather ; thereafter the wind veered to N.W., with lower temp. S set in on 28th, and the temp. fell to 14° on the forenoon of the 30th. Strong gale on the 9th ; much L on 20th ; lunar halos on 27th and 28th : S and H on 30th.

CULLODEN.—The month was favourable for work generally. A dry period with a steady bar. prevailed between the 8th and 26th.

SANDWICK.—Aurora on 2nd ; L on 9th ; S on 27th.

## IRELAND.

DROMORE.—The month was very fine, with light winds now and again, and slight frosts.

WATERFORD.—Rainfall an inch below the average, and but for the heavy falls during the first week, it would have been a very dry month ; N.E. winds prevailed during the latter half ; S.W. gale on the 4th ; thick fog on the 14th.

KILLALOE.—The amount of R was nearly the average, but the number of rainy days was much below the average. From the 11th to the 25th clear, bright, frosty days. Mean temp. 42°·4.

DUBLIN.—At first unsettled and rainy, the month ultimately proved fine and quiet, and at the close cold and winterly. The mean. temp. (43°·0) was 0°·7 below the average of 20 years. During the last 20 years there have been five Novembers with a smaller rainfall than that of the present month, the smallest being 1870, 1·22 in. Solar halo on 2nd, lunar halo on 29th ; fog on five days ; H on two days ; S on one day. Mean humidity 86 ; mean amount of cloud 5·9.

EDENFEL.—With the exception of the first week, and a few days at the end, the weather of the month was settled and fine, with sunshiny days and slight frost at night ; S on 28th and 29th.

## THE BROCKEN SPECTRE IN SCOTLAND.

*To the Editor of the "Scotsman."*

SIR,—Such of your readers as care for mountain phenomena, may be interested to learn that the appearance known as the "Spectre of the Brocken" was developed on Ben More, Perthshire, on Sunday evening.

Along with a friend, I arrived on the top of the mountain about 5 p.m, and we had not enjoyed the fine view for more than a few minutes before the wind brought up a chill mist that very shortly enveloped the whole summit. Looking into the west, where the sun was now declining, the appearance was very peculiar, the mist assuming a greenish hue, while lower down the mountain, where not so dense, it was shaded into a lovely rose colour. But it was in the east that the great surprise awaited us. Slightly above our level, and within a hundred yards, as it seemed, was a nimbus of pale light, on which the shadow of the cairn and of ourselves standing upon it were projected. Sometimes the images were quite faint, sometimes so strong that all our movements and the minutest details—such even as the spiked end of a walking stick—were depicted. There are two cairns on the top of Ben More, within forty yards of each other, and while from the one both halo and figures were visible, from the other it was the halo only. The picture lasted about five minutes, and then faded away.

I believe this phenomenon is very rarely witnessed in Scotland ; for my own part, I have climbed a great number of mountains, and never saw it till the present occasion.

I may mention that while walking down from Lochearnhead about five o'clock this morning, I saw a very perfect lunar fog-bow. The moon was bright at the time, and heavy wreaths and banks of vapour were resting in all the hollows and watercourses. This, too, I think is an appearance that is uncommon.—I am, &c.,

J. G. S.

*Edinburgh, Oct. 6, 1884.*

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXVIII.] JANUARY, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE NEW TIME.

THE English always were a rather peculiar people, and just at present we think that they are affording a striking proof of it.

In accordance with a decision arrived at by the International Geodetic Association at Rome in 1883, and with a resolution of Congress, the President of the United States issued invitations to the governments of all nations in diplomatic relation with his own, to send delegates to a conference to be held at Washington in October last, for the purpose of discussing, and if possible fixing upon, a meridian proper to be employed as a common zero of longitude, and standard of time-reckoning throughout the world. The conference was held; twenty-five nations (including Great Britain) were represented. It was resolved by an overwhelming majority that the meridian passing through the Observatory of Greenwich should be adopted as the zero of longitude. Subsequently it was resolved, without a dissentient vote, "that a universal day be adopted for all purposes, for which it may be found convenient, and which shall not interfere with local or other standard time where desirable. Finally it was resolved, by 15 votes in favour, 2 negatives, and 7 not voting, that this universal day be a mean solar day, beginning for all the world at the moment of mean midnight of the initial meridian, coinciding with the civil day and date of that meridian, and be counted from 0 up to 24 hours.

Put into popular language, these resolutions amount to this:—

The introduction into the maps published in every country of the world, of lines of longitude reckoned from Greenwich instead of, as hitherto, lines reckoned from the capital of each country.

The adoption of Greenwich time (modified for local purposes) throughout the world. (This is especially needed when, as now, telegrams arrive before the time at which they are sent off—that absurdity would vanish.)

The abolition of the a.m. and p.m., which, though defended by many, are often sadly misused; for instance, not long since we had a record of thunder at "12.15 a.m.", if the writer



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meant what he wrote, the thunder must have been shortly after midday, and should have been 0.15 p.m., but what the observer really did mean was 15 minutes after midnight, *i.e.*, 0.15 a.m. A very amusing illustration of some of the inconveniences of the reckoning twice up to 12, occurred recently. There was an earthquake at 5.15 p.m., a telegram was sent (very much condensed) to a far distant newspaper, the magic letters p.m. were omitted; the editor jumped at the conclusion that it happened in the early morning, and printed a highly coloured description of the citizens rushing about in *déshabille*, &c. If the telegram had said 17.15 the editor's subsequent feelings would have been more pleasant than they were when it was found that the earthquake occurred in the afternoon, and that his graphic description was entirely untrue.

This, however, is by no means the strongest argument for the change. The representatives of the American railways felt so strongly the importance of the whole subject, that they obtained permission to lay their views before the conference. Those who have to plan long cross journeys in accordance with *Bradshaw*, know how difficult it is to distinguish night trains from day ones.

Looking at the question from a meteorological point of view, we are certain that the carrying out of the proposal of the Conference, and the reckoning throughout the British Isles in Greenwich time, and in a single series from 0 h. at midnight, through 12 at noon to 23 h. 59 m. at midnight would (though troublesome for a week or two) be a saving of time, and of trouble, and a great help towards accuracy.

It may be asked what all this has to do with our opening assertion that the English are a rather peculiar people. We think that it is peculiar that *when the representatives of the whole world, in conference assembled, have decided upon adopting the Greenwich meridian, and Greenwich time, Englishmen forthwith act as if they took no interest in the matter.*

The movement for adopting the 24 hour notation was going forward rapidly, the press teemed with articles on the new time, a good deal of ingenuity and of banter was bestowed on designs for altering the dials of watches and clocks, and the striking of large ones. Twenty-four hour watches and clocks by the dozen, if not by the hundred, were made and exposed in the shop windows of London and of Provincial towns, about a score of patents were taken out for new forms of 24 hour clocks, and January 1st, 1885, was looked forward to as the date of the inauguration of the new system. But all of a sudden, the subject is dropped. The Astronomer Royal shifts the clock at the Observatary gates, one London clergyman announces a service for 19 h., the Isle of Wight Railway Company (all honour to it) prints its time tables on "the only rational plan," and *Voilà tout!—Bradshaw* comes out as puzzling as ever, and even takes the trouble to snub the Isle of Wight people by converting their

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figures back to "a.m." and "p.m.," except that *Bradshaw* does not condescend to put either "a.m." or "p.m.," but leaves us to guess, according to the position of the figures on the page, which ought to be there.

The addition of 12 to the ordinary name of every afternoon and evening hour, is so simple an operation that everybody would have learned it in a fortnight, but the "cold water," which some persons have thrown upon the scheme seems to have been wonderfully effective.

We await with considerable interest a statement of the reasons for checking the movement.

## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 17th instant, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., president, in the chair.

Mr. C. H. Cotton, Mr. S. A. Jolly, L.R.C.P., and Rev. C. J. Taylor, M.A., were elected Fellows of the Society.

The following papers were read :—

(1). "On the reduction of Temperature Means from short series of observations to the equivalents of longer periods," by Dr. Julius Hann, Hon. Mem.R.Met.Soc. The author has recently carried out an investigation into the climate of the Alpine districts of Austria, and in doing so he has endeavoured to reduce the monthly and annual means of all the temperature observations from the districts in question during the interval from 1848 to 1880 (and in some places to 1884) to the mean for the thirty years' period 1851 to 1880. In this paper, Dr. Hann described the methods he adopted to reduce observations at mountain stations for short periods to the equivalents of longer periods.

(2). "The diversity of Scales for registering the force of Wind," by Charles Harding, F.R.Met.Soc. The object of this paper is to call attention to the confusion that exists in the systems in use by various countries for registering wind force, whether instrumentally or otherwise, and to show the need of action for improvement. (See *Met. Mag.*, Vol. I., No. iii., April, 1866, page 19.)

(3). "Report on the Phenological Observations for the year 1884," by the Rev. T. A. Preston, M.A., F.R.Met.Soc. The salient features of the weather during the period embraced in this report, viz., October 1883 to September 1884, were :—The mild winter; the cold April; the hot August, and the long period of drought, which at the end of September began to be seriously felt. The general effects on vegetation have been the prolonged existence of many of the autumn species; the great loss of wall fruit; the failure of bush fruits; the plentiful supply of strawberries as long as they lasted, but the time was short; the good hay harvest, although it was light in quantity; the good corn crop; the unusually plentiful potato crop; and the great abundance of wild fruits.

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## THE AMERICAN METEOROLOGICAL JOURNAL.*

In our April number we announced the probable commencement of the above-named journal. Now that eight numbers, amounting in the aggregate to 340 pages, have appeared, we may appropriately offer a few remarks upon its contents. Quantity and price are very secondary considerations; they may, therefore, as well be disposed of at once. Each number is about three times the bulk of one of ours, and nearly three times the price.

In No. 1 the formation of an American Meteorological Society is suggested, on a later page we have, in the efforts of the American Ornithologists' Union, a partial equivalent to the phenological work of the Royal Meteorological Society. Tornadoes being so much more violent and frequent in the States than in Europe, much attention is devoted to them. A full account is given of the organization of the Ohio Meteorological Bureau by its president, Prof. T. C. Mendenhall (who if we mistake not was formerly in charge of the meteorological observations in Japan) and of the commencement of distributing weather forecasts by attaching large symbols to the luggage trains. The extremely good paper by M. Radau in the *Bulletin Astronomique* for January 1884, is translated, and in five pages of small type gives the best summary of the twilight phenomena of 1883–4 which we have seen in English.

In No. 2 there is a well founded complaint of the application of the word cyclone, which is the proper term for a gyrating body of air hundreds of miles in diameter, to small circular storms of little more than as many yards; these it is urged should be designated tornadoes. There is also a careful paper on, with original maps of, the Winds and Currents of the Equatorial Atlantic, by Prof. W. M. Davis. The paper on the rainfall of Nebraska is interesting and valuable, but would have been far more so had a page of tabular values been added. If the returns are all correct, the fluctuation of rainfall is excessive, as may be judged by the following:—"For example, Bellevue had 59·92 (should be 50·92) inches in 1858, and but 18·57 in. in 1859." The one is about 78 per cent. above, and the other about 43 per cent. below the mean, a fluctuation of 121 per cent. in two consecutive years. In the British Isles it is very rare for one of two consecutive years to have twice the fall of the other, but these records would make that in 1858 two and three quarter times that in 1859. Many useful translations are given, *e.g.*, those of the paper by Dr. Schwirkus, on the construction of Aneroid Barometers, originally published in the *Zeitschrift für Instrumentenkunde*, and by Dr. Assmann, on the Sling Thermometer (from the *Zeitschrift d. Oesterr. Gesell. f. Met.*) but as altogether the numbers before us must contain nearly 100 articles, besides three or four times that number of short notes, it is obviously inexpedient for us

* W. H. Burr & Co., Detroit, Michigan.

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to attempt to enumerate them. The *American Meteorological Journal* has an important future before it, and we are glad to note that it has already appointed as European publishers the great firm of Brockhaus, of Leipsic, Berlin and Vienna. Englishmen would probably prefer getting it through the post, by remitting direct to the publishers at Detroit.

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## POPULAR PROGNOSTICS.

*To the Editor of the Meteorological Magazine.*

SIR,—I cannot resist giving a "random reading," which I fell in with in an old "Description of England and Wales," by "Herman Moll, Geographer." Folio: MDCCXXIV.

Of course I do not claim to have made any mighty discovery, or to throw any light on a mysterious subject, but under "Staffordshire," p. 222, occurs the following:—

> "The Dove . . . runs through a Lime-Stone Soil, and sucks in such Fertility from it, that the Meadows on every Side appear fresh and green in the dead of Winter; and when it happens to overflow them in April, it fructifies them so much, that the Inhabitants hereabouts joyfully apply the following Rhime to it:—
>
> "In April, Dove's Flood,
> Is worth a King's Good."

In Dr. Clouston's "Popular Weather Prognostics," p. 50:—

> (22) "In April a dove's flood
> "Is worth a King's good.
>
> "(22). I never met with this saying before, and I know not in what district it prevails. As a dove is not fond of water, and a real flood would be no blessing in April, I am inclined to interpret the 'flood' negatively as dry weather, and in this sense, it is of great value for sowing the seed that has not been got into the soil in March."

I confess I felt highly tickled as I pictured the worthy doctor puzzling his brain as to the literal interpretation of the enigma, and in his despair ignoring the literal and affirmative side, and rushing to a negative solution, and pointing out its great value in this sense. It must have been a great puzzle. Doves certainly are not aquatic birds—as a rule—if so, nature would have made them web-footed. Noah's dove had considerable experience of the water, but didn't take kindly to it. I don't know any other flood that could be more appropriately termed "dove's flood." Unfortunately the big "D" had dropped in transition from Staffordshire to the Orkneys, without being at all aware of the perplexity it was causing by so doing, and so recently as 1867 big "D" had never been replaced out there. This is a very harmless joke of mine, and probably no one would have enjoyed it more than the worthy doctor himself. By your "In

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Memoriam" I learn that his observations are for ever ended, and he seems to have been a most worthy, intelligent, and useful man, and to have justly merited the esteem of his countrymen.

What would you call this joke, a Clerical error, or a Capital blunder?

G. W. ATKINSON.

*Culgaith Vicarage, Penrith.*

[This letter is so interesting, that we are afraid that in adding a few lines we shall spoil it. Still, to be accurate is our first duty, and we have to add a little to the history of the Dove, which Mr. Atkinson has so happily corrected. Dr. Arthur Mitchell was, as far as we can trace, the original source of this droll muddle, for he gives the proverb in his *Popular Weather Prognostics of Scotland*, and spells it "a dove's." What authority Dr. Mitchell had for taking the bird to Scotland, and for entering it in a Scotch collection, remains to be seen; but Dr. Clouston might well say as he did, "I never met with this saying before, and I know not in what district it prevails.—ED.]

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## THE THUNDERSTORMS OF 1884.

*To the Editor of the Meteorological Magazine.*

SIR,—I was not aware you had intended to prolong your account of the July thunderstorms to August, or I would have reported that on August 9th there was here perhaps the most awfully grand one I ever witnesssed. There were 14 flashes per minute about 9 p.m.; many were multiple, and an unusually large proportion forked. No. 65, Coronation-street, and No. 4, Herrington-street were struck; but the damage was small. A young woman in a house in Ward-street was struck, though the house was not; she was dangerously ill for a week or two, but ultimately recovered.—Yours truly,

T. W. BACKHOUSE.

*West Hendon House, Sunderland, Dec. 19, 1884.*

[It appeared to us so remarkable for any one in a house to be struck while the house was not, that we asked Mr. Backhouse if it was not a nervous derangement caused by fright. He has favoured us with the reply which we append.—ED.]

SIR,—On enquiry, the illness of the young woman reported does not appear to be at all attributable to fright. She was near the window, which at the time was shut; and felt a sudden pain in her head, but the unconsciousness and severe effects were not at once produced, for she was able to walk to a neighbouring house. She saw the flash, but did not hear the thunder, which seems strange if she really was struck; I understand, however, that her medical attendant considered she had been.

Yours truly, T. W. BACKHOUSE.

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## SCRAPS.

THE NEW MOUNTAIN STATION IN SOUTH AUSTRALIA.—Encouraged by the tentative results of the past month, Mr. Clement L. Wragge has now extended his plan of operations on Mount Lofty (2,350 ft. above sea), and has established, as a further experiment, a substantially equipped meteorological observatory there. The barometer is a fine instrument on the Kew pattern, with an extended scale for special use at high level stations, made to Mr. Wragge's order by Adie & Wedderburn, of Edinburgh. It is protected by a stout, double-sided box, screwed to an angle-post of the Government fence. The aneroid-barograph is set by this instrument, and works admirably, and being checked at intervals, there is a continuous and faithful record of every variation of pressure. The hygrometer and self-registering thermometers are now exposed in an improved and enlarged pattern of Stevenson's double-louvred screen, fixed in position on October 31st, and specially constructed to suit the conditions of the Australian climate. Earth thermometers, and another rain-gauge, have also been added. The instruments of the Torrens Observatory are similarly exposed; and readings are taken there in direct connection with the observations on the Mount.—*Adelaide Evening Journal*, Nov. 3rd, 1884.

CURIOUS CASE OF CAUSE AND EFFECT.—During the storm at Greenville, Rhode Island, May 9th, the lightning ran by the telephone wire to the Windsor Mill, where there is no telephone, but the wire is disconnected just outside the building. The lightning was led by the wire to the corner of the mule and weaving-rooms, and entered the building under the jet. It followed the water pipe, and set the sprinklers going, and at the same time fired the stock in the mules. By this singular provision of an active extinguishing agent at the moment the fire started, serious loss was prevented, as the fire was soon drowned out. Many of the spindles in the mules lost their temper, and some of the belts were burned, but the mill was saved.

[We remember a parallel case in which the lightning followed a telegraph wire into a post-office, jumped across to a composition gas-pipe, ignited the gas, and by the heat of the gas, a water-pipe above it was fused, and the water escaping saturated everything, and prevented further damage.—ED.]

JAPANESE WEATHER MAPS.—Mr. E. Knipping, meteorologist of the Imperial Meteorological Observatory at Tokio, describes in the September number of the *Mittheilungen der deutschen gesellschaft für natur-und völkerkunde Ostasiens*, the rapid development of weather telegraphy in Japan. There are now twenty-four stations in the empire connected by telegraph; and on the basis of their observations, supplemented by despatches from China, three daily synoptical maps are published in Japanese and English characters. Observations are taken at six a.m., and two and nine p.m. "Japan" time, which is about that of the Kioto meridian; so that the evening observation corresponds to eight o'clock, "China coast" time, six o'clock "Bengal" time, four o'clock "Persian" time, one o'clock "German" time, and noon in "English" (Greenwich) time. The director of the service is Mr. J. Arai; and the observers, telegraphers, draughtsmen, and printers, are all Japanese. The first weather map was printed on March 1st, 1883, and the tri-daily issue began a month later. The chief need of the service at present, is the addition of the fifty-six lighthouses to the other stations, and the construction of a sub-marine cable to the Linkin (Loo Choo) Islands.—*Science*, Cambridge, Mass. Dec. 5th).

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 81·3 | 24 | 35·0 | 1 | 66·3 | 44·7 | 44·2 | 67 | 102·2 | 40·9 | ·78 | 11 | 5·2 |
| Malta | 78·8 | 5 | 53·0 | 5 | 72·4 | 59·4 | 58·7 | 80 | 142·5 | 46·5 | ·64 | 5 | 3·0 |
| *Mauritius* | 79·9 | 6 | 58·6 | 13 | 77·6 | 66·9 | 64·0 | 77 | 127·7 | 48·3 | 12·81 | 14 | 5·2 |
| Calcutta | 96·3 | 19 | 68·3 | 6 | 92·0 | 76·3 | 76·2 | 78 | 156·4 | 62·9 | 5·86 | 14 | 4·4 |
| Bombay | 91·3 | 29 | 76·2 | 2 | 89·4 | 79·2 | 75·3 | 74 | 143·8 | 67·4 | 0·00 | 0 | 2·2 |
| Ceylon, Colombo | 87·0 | 9 | 73·3 | 12 | 86·1 | 77·8 | 73·8 | 77 | 143·0 | 66·0 | 10·31 | 25 | 7·0 |
| *Melbourne* | 77·0 | 9 | 38·0 | 21 | 62·0 | 45·8 | 46·1 | 79 | 124·3 | 30·3 | 2·15 | 10 | 6·6 |
| *Adelaide* | 78·2 | 2 | 40·3 | 25 | 64·1 | 50·1 | 47·3 | 70 | 136·3 | 31·9 | 2·39 | 16 | 6·0 |
| *Wellington* | 62·0 | 18* | 39·3 | 9 | 57·9 | 48·4 | ... | ... | 119·0 | 35·0 | 8·02 | 17 | ... |
| *Auckland* | 65·5 | 7 | 37·5 | 31 | 60·3 | 48·6 | 45·2 | 70 | 123·0 | 30·0 | 4·19 | 16 | 5·6 |
| Jamaica, Kingston | 87·2 | 21 | 67·3 | 3 | 85·5 | 71·5 | 72·5 | 82 | ... | ... | 3·09 | ... | 5·2 |
| Barbados | 84·0 | var. | 70·0 | var. | 81·0 | 72·0 | 73·2 | 81 | 143·0 | 69·0 | 4·70 | 17 | 6·0 |
| Toronto | 75·7 | 23 | 28·0 | 3 | 59·9 | 41·9 | 42·8 | 71 | 131·8 | 19·8 | 2·26 | 17 | 6·4 |
| New Brunswick, Fredericton | 79·6 | 26 | 28·5 | 6 | 58·4 | 37·1 | 37·3 | 71 | ... | ... | 4·99 | 18 | 6·3 |
| Manitoba, Winnipeg | 85·4 | 17 | 24·7 | 13 | 66·6 | 38·5 | 40·7 | 63 | ... | ... | ·34 | 4 | 2·8 |
| British Columbia, Spence's Bridge | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

* And 27, 28.

### REMARKS, MAY, 1884.

MALTA.—Mean temp., 64°·9; mean hourly velocity of wind, 9·3 miles; sea temp. rose from 65° to 71°. T8 on the 22nd. J. SCOLES.

*Mauritius.*—Rainfall 7·87 in. above, and mean temp. 1°·2 below average; max. velocity of wind 26·2 miles on 27th, min. 1·6 miles on 19th, prevailing direction S.E. by S., to E. Heavy floods on night of 6th, with T and L. Coloured skies before sunrise and after sunset throughout, but not so intense as in 1883. C. MELDRUM, F.R.S.

CEYLON.—Thunderstorms occurred on eight days. J. H. SYMONDS.

*Melbourne.*—Mean temp. of air 0°·3 below average. Temp. of dew-point, humidity, amount of cloud, pressure, and rainfall all remarkably near their respective averages. Prevailing winds N. and W., strong breezes on five days. Heavy dew on nine days, dense fog on three days, T and L on 10th. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure ·069 in. above, and mean temp. slightly below average; max. temp. the highest in May since 1868; total range unusually large. Rainfall 0·80 in. below average; amount of cloud average. The weather was fine and warm during the first week, then showery until the 23rd, then again fine and pleasant to the end of the month. The "red glow" increased in intensity, presenting a beautiful spectacle on each clear evening during the latter half of the month. C. TODD.

*Wellington.*—Generally showery, unpleasant weather till 13th, 1·95 in. of R being recorded on that date; from the 14th to the 21st fine with N. wind; from the 22nd to the 28th showery, with at times heavy R and very unpleasant weather; the remainder of the month was fine. Strong S.E. gale on 12th and 13th; fog on 3 days. Mean pressure and temp. very near their respective averages. R. B. GORE.

*Auckland.*—Rather wet and showery, with heavy rain on 16th and 21st. Bar. fluctuating greatly. T. F. CHEESEMAN.

BARBADOS.—Mean temp., 75°·6, 1°·4 below the average. N.E. winds prevailed on 29 days, and E. on 2 days; mean hourly velocity 11 miles, the same as the average; extremes 16·4 miles and 5 miles. Rainfall 5 per cent. above the average; six days were overcast. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·80 | XI. | Carno, Tybrith ... ..... | 8·25 |
| ,, | Margate, Birchington... | 2·85 | ,, | Corwen, Rhug ..... | 5·04 |
| ,, | Littlehampton ..... | 4·34 | ,, | Port Madoc ..... | 6·06 |
| ,, | Hailsham ..... | 4·37 | ,, | I. of Man, Douglas ..... | 5·26 |
| ,, | I. of W., St. Lawrence. | 4·84 | XII. | Stoneykirk, Ardwell Ho. | 4·05 |
| ,, | Alton, Ashdell..... | 4·13 | ,, | Melrose, Abbey Gate... | 2·92 |
| III. | Winslow, Addington ... | 2·65 | XIII. | N. Esk Res. [Penicuick] | 5·15 |
| ,, | Oxford, Magdalen Col... | 2·07 | XIV. | Ayr, Cassillis House ... | 5·77 |
| ,, | Northampton ..... | 1·80 | ,, | Glasgow, Queen's Park. | 6·12 |
| ,, | Cambridge, Beech Ho... | 1·75 | XV. | Islay, Gruinart School.. | 6·67 |
| IV. | Southend ..... | 1·90 | XVI. | St. Andrews, Newton Bk. | 2·60 |
| ,, | Harlow, Sheering ... .. | 2·09 | ,, | Balquhidder, Stronvar.. | 12·29 |
| ,, | Diss ..... | 2·64 | ,, | Dunkeld, Inver Braan.. | 4·51 |
| ,, | Swaffham ..... | 2·19 | ,, | Dalnaspidal H.R.S. ... | 9·32 |
| ,, | Hindringham ..... | ... | XVII. | Keith H.R.S. ..... ..... | 1·67 |
| V. | Salisbury, Alderbury... | 2·81 | ,, | Forres H.R.S. ..... ... | 1·59 |
| ,, | Warminster ..... | 3·84 | XVIII. | Strome Ferry H.R.S.... | 6·39 |
| ,, | Calne, Compton Bassett | 2·89 | ,, | Lochbroom ..... | 7·22 |
| ,, | Ashburton, Holne Vic.. | 10·14 | ,, | Tain, Springfield..... | 2·07 |
| ,, | Holsworthy, Clawton... | 4·84 | ,, | Loch Shiel, Glenaladale | 15·93 |
| ,, | Lynmouth, Glenthorne. | 7·69 | ,, | Invergarry ..... | 10·14 |
| ,, | Probus, Lamellyn ..... | 3·95 | XIX. | Lairg H.R.S. ..... | 3·09 |
| ,, | Wincanton, Stowell Rec. | 3·33 | ,, | Forsinard H.R.S. ..... | 3·19 |
| ,, | Taunton, Fullands ..... | ... | ,, | Watten H.R.S. ..... | 2·03 |
| VI. | Bristol, Clifton ..... .. | 5·29 | XX. | Dunmanway, Coolkelure | 9·65 |
| ,, | Ross ..... | 2·59 | ,, | Fermoy, Gas Works ... | 2·80 |
| ,, | Wem, Sansaw Hall..... | 1·60 | ,, | Tralee, Castlemorris ... | 4·09 |
| ,, | Cheadle, The Heath Ho. | 2·92 | ,, | Tipperary, Henry Street | 4·65 |
| ,, | Worcester, Diglis Lock | 1·72 | ,, | Newcastle West ..... | 6·75 |
| ,, | Coventry, Coundon ..... | 2·04 | ,, | Miltown Malbay..... | 5·48 |
| VII. | Melton, Coston ..... | 2·06 | ,, | Corofin ..... | 3·10 |
| ,, | Ketton Hall [Stamford] | 1·96 | XXI. | Carlow, Browne's Hill.. | 3·77 |
| ,, | Horncastle, Bucknall ... | 2·10 | ,, | Navan, Balrath ..... | 3·03 |
| ,, | Mansfield, St. John's St. | 2·24 | ,, | Mullingar, Belvedere ... | 4·76 |
| VIII. | Macclesfield, The Park. | 3·57 | ,, | Athlone, Twyford ..... | 5·72 |
| ,, | Walton-on-the-Hill..... | ... | XXII. | Galway, Queen's Col.... | 5·92 |
| ,, | Lancaster, South Road. | 4·44 | ,, | Clifden, Kylemore ..... | 10·34 |
| ,, | Broughton-in-Furness .. | ... | ,, | Crossmolina, Enniscoe.. | 6·56 |
| IX. | Wakefield, Stanley Vic. | 1·49 | ,, | Carrick-on-Shannon ... | 4·21 |
| ,, | Ripon, Mickley ..... | 4·38 | XXIII. | Dowra ..... | 2·73 |
| ,, | Scarborough..... | 2·05 | ,, | Rockcorry..... | 3·67 |
| ,, | East Layton [Darlington] | 2·66 | ,, | Warrenpoint ..... | 4·81 |
| ,, | Middleton, Mickleton.. | 6·36 | ,, | Newtownards ..... | 2·73 |
| X. | Haltwhistle, Unthank.. | 5·08 | ,, | Belfast, New Barnsley.. | 4·71 |
| ,, | Shap, Copy Hill ..... | 9·92 | ,, | Cushendun ..... | 5·54 |
| XI. | Llanfrechfa Grange ..... | 6·14 | ,, | Bushmills ..... ..... | 4·79 |
| ,, | Llandovery ..... | 8·45 | ,, | Stewartstown ..... | 3·63 |
| ,, | Lower Solva ..... | 5·03 | ,, | Donegal, Revelin Ho.... | ... |
| ,, | Castle Malgwyn ..... | 4·62 | ,, | Buncrana ..... | 4·87 |
| ,, | Rhayader, Nantgwillt.. | 9·23 | ,, | Carndonagh ..... | ... |

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# DECEMBER, 1884.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Mg. hs. in shade. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | |
| I. | ENGLAND. | London (Camden Square) | 2·57 | + ·40 | ·41 | 5 | 17 | 55·7 | 8 | 28·5 | 31 | 5 |
| II. | | Maidstone (Hunton Court) | 2·65 | + ·25 | ·37 | 11 | 20 | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 2·27 | + ·25 | ·32 | 11 | 18 | 54·8 | 13 | 20·8 | 31 | 10 |
| III. | | Hitchin | 2·26 | + ·21 | ·49 | 7 | 18 | 59·0 | 6 | 24·0 | 30*b* | 19 |
| ,, | | Banbury | 2·10 | — ·05 | ·27 | 2, 3 | 19 | 53·5 | 13 | 25·0 | 31 | 16 |
| IV. | | Bury St. Edmunds (Culford) | 2·64 | + ·49 | ·50 | 7 | 18 | 54·0 | 6, 7 | 23·0 | 30 | 10 |
| ,, | | Norwich (Cossey) | 2·45 | + ·13 | ·35 | 19 | 19 | 55·0 | 6, 7 | 23·0 | 31 | 5 |
| V. | | Weymouth(LangtonHerring) | 4·29 | ... | ·68 | 16 | 17 | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 4·97 | + 1·21 | ·74 | 5 | 20 | 56·0 | 8 | 32·0 | 25 | 1 |
| ,, | | Bodmin | 5·34 | — ·11 | ·80 | 5 | 21 | 54·0 | 7 | 27·0 | 29 | 10 |
| VI. | | Cirencester | 3·74 | + 1·13 | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·65 | + ·86 | ·53 | 16 | 17 | 53·5 | 13 | 26·0 | 24*b* | 16 |
| ,, | | Tenbury (Orleton) | 2·24 | — ·27 | ·37 | 14 | 17 | 56·5 | 6 | 25·5 | 31 | 7 |
| VII. | | Leicester | 2·40 | ... | ·31 | 3 | 19 | 54·0 | 6 | 23·2 | 1 | 8 |
| ,, | | Boston | 1·91 | — ·16 | ·46 | 3 | 13 | 55·0 | 13 | 26·0 | 1 | 8 |
| ,, | | Grimsby (Killingholme) | 2·63 | + ·20 | ·39 | 19 | 19 | 54·0 | 13 | 30·0 | 1*b* | 3 |
| ,, | | Hesley Hall [Tickhill] | 1·35 | ... | ·26 | 4 | 17 | 57·0 | 13 | 24·0 | 31 | 8 |
| VIII. | | Manchester (Ardwick) | 3·64 | + 1·11 | ·54 | 14 | 16 | 56·0 | 13 | 27·0 | 27 | 15 |
| IX. | | Wetherby (Ribston Hall) | 2·46 | + ·25 | ·42 | 20 | 10 | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 10·11 | + 4·83 | 1·30 | 7 | 19 | ... | ... | ... | ... | ... |
| X. | | North Shields | 1·68 | — 1·41 | ·32 | 4 | 21 | 57·5 | 3 | 27·5 | 24 | 12 |
| ,, | | Borrowdale (Seathwaite) | 19·22 | + 5·49 | 2·76 | 12 | 21 | 52·0 | 13 | 21·5 | 29 | 5 |
| XI. | WALES. | Cardiff (Ely) | 6·53 | + 2·62 | ·83 | 5 | 20 | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest | 4·65 | — ·48 | ·99 | 5 | 17 | 54·0 | 13 | 24·5 | 28 | 11 |
| ,, | | Plinlimmon (Cwmsymlog) | 7·15 | ... | 1·02 | 5 | 19 | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 2·92 | + ·07 | ·65 | 14 | 17 | 55·0 | 14 | 27·0 | 29 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] | 4·40 | — ·13 | ·67 | 10 | 18 | 51·8 | 13 | 20·8 | 23 | 13 |
| ,, | | Hawick (Wilton Hill) | 1·99 | ... | ·40 | 9 | 17 | .... | ... | ... | . | ... |
| XIV. | | Douglas Castle (Newmains) | 7·29 | + 3·20 | 1·12 | 18 | 19 | ... | ... | 22·0 | 21 | 12 |
| XV. | | Lochgilphead (Kilmory) | 9·14 | + 2·96 | ·92 | 12 | 23 | ... | ... | ... | .. | ... |
| ,, | | Oban (Craigvarren) | 6·59 | ... | ·80 | 9 | 21 | 57·0 | 14 | 31·5 | 29 | 1 |
| ,, | | Mull (Quinish) | 8·03 | ... | ·99 | 1 | 24 | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices | 6·20 | + 2·54 | ·80 | 16 | 18 | ... | ... | ... | ... | ... |
| ,, | | Arbroath | 2·64 | — ·26 | ·51 | 7 | 14 | 51·0 | 14 | 22·0 | 23 | 18 |
| XVII. | | Braemar | 2·44 | — ·99 | ·59 | 9 | 15 | 45·8 | 12 | 15·3 | 22 | 23 |
| ,, | | Aberdeen | 1·84 | ... | ·50 | 2 | 17 | 53·0 | 14 | 25·0 | 23 | 14 |
| XVIII | | Skye (Sligachan) | 18·81 | ... | 2·68 | 14 | 23 | ... | ... | ... | ... | ... |
| ,, | | Culloden | 2·66 | + ·82 | ·86 | 8 | 8 | 53·0 | 14 | 21·0 | 1 | 11 |
| XIX. | | Dunrobin | 2·03 | ... | ·40 | 13 | 17 | 52·0 | 14 | 24·2 | 23 | 13 |
| ,, | | Orkney (Sandwick) | 4·31 | — ·08 | ·51 | 13 | 20 | 49·0 | 14 | 25·6 | 1 | 2 |
| XX. | IRELAND. | Cork (Blackrock) | 3·64 | — 1·12 | ·44 | 3 | 20 | 57·0 | 13 | 26·0 | 21*d* | 9 |
| ,, | | Dromore Castle | 7·58 | ... | 1·50 | 5 | 21 | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) | 2·96 | ... | ·45 | 1 | 20 | 53·0 | 2, 13 | 25·5 | 22 | 10 |
| ,, | | Killaloe | 7·50 | ... | ·85 | 18 | 23 | 51·0 | 1 | 24·0 | 24 | 8 |
| XXI. | | Portarlington | 3·54 | + ·68 | ·32 | 18*a* | 23 | 55·0 | 13 | 26·0 | 22 | 13 |
| ,, | | Dublin (FitzWilliam Square) | 2·01 | — ·57 | ·37 | 7 | 20 | 56·4 | 13 | 27·3 | 22 | 5 |
| XXII. | | Ballinasloe | 5·44 | + 1·96 | ·56 | 8 | 24 | 49·0 | 2, 12 | 22·0 | 24 | 15 |
| XXIII | | Waringstown | 3·81 | + ·35 | ·44 | 19 | 21 | 57·0 | 25 | 22·0 | 21 | ... |
| ,, | | Londonderry (Creggan Res.) | 4·71 | ... | ·52 | 18 | 25 | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) | 4·40 | + 1·00 | ·55 | 7 | 23 | 52·0 | 13 | 26·0 | 21*c* | 61 |

*a* And 29. *b* And 31. *c* And 23. *d* And 23, 25, 26.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The weather of the first part of the month was very mild; but it became colder later. As late as the 14th over 30 varieties of wild flowers in their second or autumn blossoms could be gathered.

BANBURY.—A windy month, with very little fog. Temp. about the average, and varying but little between night and day during the last week; mean, 39°·8. High wind on 11 days; S six days; L and H on 18th.

LANGTON HERRING.—The wet weather which set in on November 30th, continued without intermission until December 11th, and heavy R fell at intervals till 19th, making it the wettest month of the year; on only one of the 17 days on which R fell was less than ·08 in. recorded. Mean temp. about 1° above the average; from 21st to 30th the wind kept steadily in the N.E., the days were very cold, and the range of temp. remarkably small. Gale on 4th.

BODMIN.—A very genial month.

WOOLSTASTON.—The first part of the month was very wet, R falling almost daily till the 19th; the latter part was cold and dry, with sharp frost at night. A severe gale blew on the 4th, and high winds and sharp squalls prevailed between the 10th and 19th; T and L, with a violent storm of H, on 18th; mean temp. 37°·7.

ORLETON.—The temp. of the first 15 days was much above, and that of the remainder of the month was below the average; the mean for the month being about 2° above the average. The sky was generally covered with cloud, and R was registered on almost every day till the 20th, but it fell mostly in small quantities, so that the total fall in the month was less than the average. On the night of the 18th frequent L was seen from S.W. to N.W., but very distant. This was followed on the night of the 19th by a great gale of wind, and heavy R on the morning of the 20th. The weather was afterwards very cloudy and cold, with N. and E. winds, but no severe frosts.

BOSTON.—A very severe gale, accompanied by T, occurred on 18th, and in a garden in the outskirts of the town a whirlwind did very considerable damage by destroying the glasshouses, uprooting fruit trees, and tearing the stems of the vines in the vinery off near the ground.

KILLINGHOLME.—A seasonable month, cold but not severe; dark mornings.

MANCHESTER.—The early part of the month was wet, the R being most welcome, as fears of a water famine prevailed in Lancashire and some parts of Yorkshire. The latter half of the month was generally fine, with frosty mornings, with a fair amount of ice during the last week, to the great delight of skaters.

ARNCLIFFE.—R fell daily from 1st to 19th inclusive, and none afterwards, and there were four days on which the fall exceeded 1·00 in.

SEATHWAITE.—During the first 19 days of the month more than 19 inches of R fell; nine days had falls exceeding 1·00 inch, and two days falls exceeding 2·50 inches. H on 5 days. T and L on 3 days.

## WALES.

HAVERFORDWEST.—The commencement of the month was gloomy, with much cold R, and at times stormy with H. The period from the 18th to the 26th was very stormy, with L and H. The wind on the 19th increased to a gale, exceeding, in violence and in amount of damage done, any gale which has of late years visited this place. Houses were unroofed, scores of trees blown down, and farm-yards much torn by its violence. From the 21st to the 31st, there was a hard frost, with E. wind steadily prevailing. No S fell during the month, which was,

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on the whole, a very seasonable December. Scarlatina prevailed rather extensively.

LLANDUDNO.—December was very near the average, both in regard to mean temp. and range, diurnal and monthly.

## SCOTLAND.

CARGEN.—Very stormy and wet from 1st to 19th; subsequently generally very fine and frosty; mean temp. 1° below average; L on 4th and 6th. Remarkable and beautiful phenomena occurred at sunrise on the 8th and 11th. The sky was generally covered with an even layer of darkish cloud, with several openings in it. Towards the S.E. these openings were edged with three distinct narrow bands of the prismatic colours, the remainder of the space being filled in with gorgeous colouring, exactly resembling a sheet of fine mother-of-pearl shell. The phenomenon lasted about an hour on each occasion, the colours fading and getting brighter at times. Small nimbus clouds at a low level were moving rapidly from the W. The higher strata of cloud, in which the phenomenon appeared, had little apparent motion. The openings, in which the colouring appeared, changed their shape and size very slowly.

HAWICK.—Heavy falls of snow occurred on 4th, 14th, and 15th. Much L of a curious blue colour was seen on nights of 13th and 14th. From the 20th to the end of the month the weather was dry and frosty.

OBAN.—The first part of the month was stormy with daily R and some gales, especially on 14th and 19th. Thereafter the weather cleared up and remained very fair to the end of the month, with occasional frost and mists resembling October. The sunsets, when seen, were very fine, with the usual high refraction. T and L on the 3rd, 7th, and 8th; H on seven days; S on the 15th.

QUINISH.—Cold, wet, and stormy until the 19th, thereafter fine and dry with occasional slight frost.

ABERDEEN.—Altogether the month was fine and open, with a rainfall greatly below the average. Aurora was observed only once, L twice, but hoar frost was very frequent. Lunar halos on 3rd and 30th, and brilliant "after glow" on the 21st. Not much S. On the morning of the 7th transparent cloudlets to southeastward (about 30° above the horizon) became prismatic at 8 a.m., and continued so until sunrise.

CULLODEN.—Weather open with frequent R till 15th. The latter part of the month frosty and fair.

## IRELAND.

WATERFORD.—Rainfall rather more than half-an-inch below the average of ten years.

KILLALOE.—Very wet and wintry for the first three weeks, but the closing portion of the month was fine and dry, with slight frosts. Brilliant aurora appeared in the N.W. on the night of the 22nd.

DUBLIN.—Wet, stormy, and open during the first three weeks, the weather changed about the 20th, from which day to the close, it was quiet, cold, and often foggy. The mean temp. (40°·8) was 0°·3 above the average. Mean humidity 85; mean amount of cloud, 6·0; prevailing winds, W. and S.W. Lunar halo on 5th; a little S on 17th; H on two days; and more or less fog on four days. Strong winds occurred on 16 of the first 20 days.

EDENFEL.—Up to the 20th the weather was extremely wet and unsettled with S on 15th, 16th, and 17th; the last ten days were calm and damp, but almost without R, and with but little frost, a thick canopy of cloud rendering them preternaturally murky and dark even for December.

END OF VOL. XIX.

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# SYMONS'S

## MONTHLY

# METEOROLOGICAL

# MAGAZINE.

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VOLUME THE TWENTIETH.

1885.

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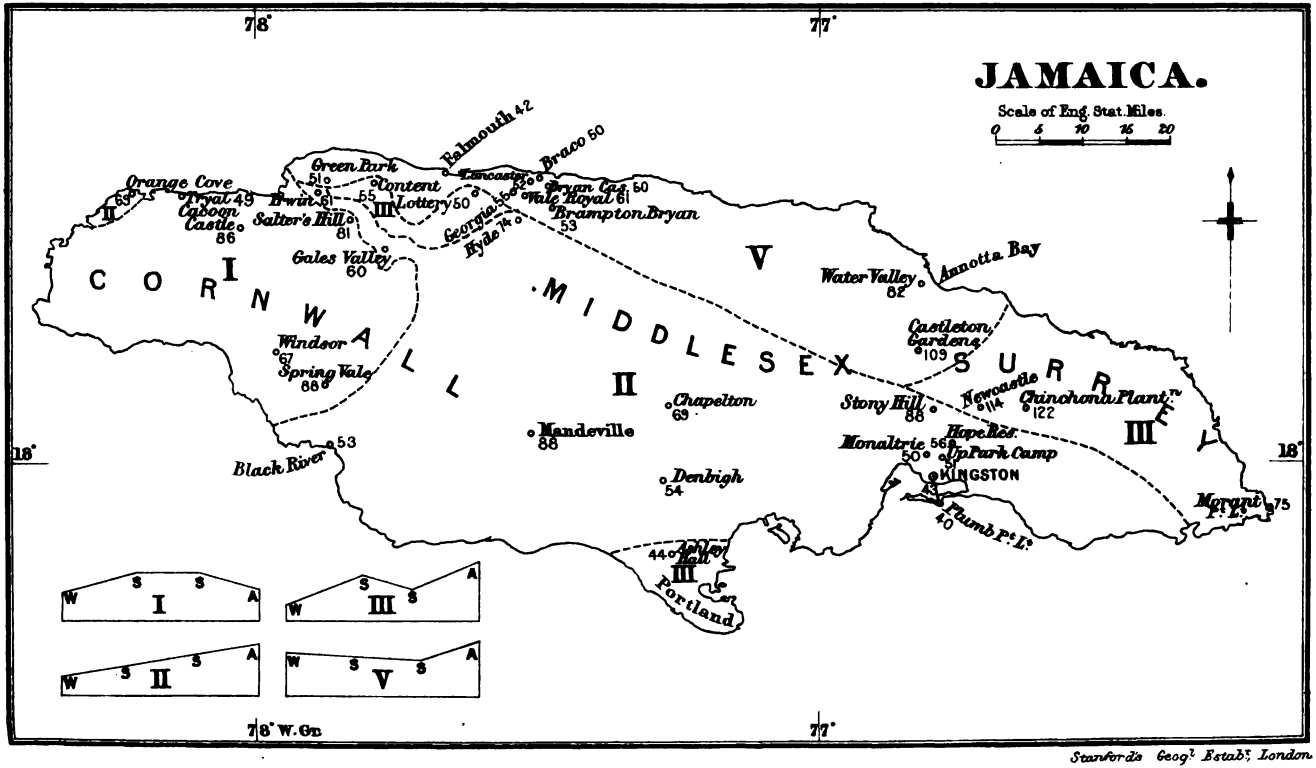


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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXIX.] FEBRUARY, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## DISTRIBUTION OF RAIN IN JAMAICA DURING THE DECADE 1871-80.

BY PROF. V. RAULIN, *of Bordeaux.*

JAMAICA is formed by a mountain chain running nearly E. and W., commencing on the east with the Blue Mountains, which rise to 7,277 feet, and ending with the Dolphin Head towards the west, which is itself 3,445 feet in altitude. Long slopes and plains reach from the mountains to the northern and southern coasts. During the period 1871-80, there were 55 stations at which observations were made during from 4 to 10 years; at 8 others the periods extend to from 11 to 18 years, and at the two military hospitals at Up Park Camp and at Newcastle, they reach to 22 and 28 years respectively.

The seasonal distribution of rainfall in Jamaica is nearly as varied as that of Southern France.

*Régime* I. is found only in the western part of the island, W. of a line drawn from Falmouth to Black River Bay.

*Régime* II. forms to the S. of Falmouth a narrow zone, which S.E. of Hyde expands over the whole southern part, from Black River Bay to beyond Kingston. It is also found at the N.W. extremity of the island.

*Régime* III. forms a narrow zone at a short distance round Falmouth, prevails on the east of the island from Newcastle to Morant Point, and re-appears on the south side at the base of the Portland peninsula.

*Régime* V. prevails along the N. shore from Falmouth to Annotta Bay.

We have thus (with the exception of some isolated stations) *Régime* I. in the west of the island, *Régime* II. in the south (with an extension to N.), *Régime* III. in the east, and *Régime* V. along the N.

In the eastern part of Cornwall, *Régimes* I., II., III. and V. follow in succession from S.W. to N.E. between Windsor and Falmouth, just as they do in southern France from Clermont-Ferrand, past Limoges to la Rochelle.



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## RAINFALL IN JAMAICA.

| Stations. | Height ft. | Years. | Winter in. | Spring in. | Summ'r in. | Aut'mn in. | Year. in. |
|---|---|---|---|---|---|---|---|
| **Régime I. (as at Moulins).**—*Dry Winter and Wet Summer.* | | | | | | | |
| 56. Tryall | 120 | 1876–79 (4) | 5·44 | 8·65 | 19·60 | 15·16 | 48·85 |
| 9. Cacoon Castle | 900 | 1873–79 (7) | 13·27 | 20·19 | 29·12 | 23·32 | 85·90 |
| 8. Burnt Ground | 800 | 1873–79 (7) | 9·49 | 24·96 | 33·24 | 26·50 | 94·19 |
| 16. Copse | 740 | 1873–79 (6⅔) | 10·54 | 21·78 | 30·21 | 29·34 | 91·87 |
| 11. Catherine Mount | 180 | 1873–79 (7) | 12·73 | 13·19 | 19·75 | 17·93 | 63·60 |
| 50. Salter's Hill | 889 | 1868–79 (11⅓) | 14·66 | 19·47 | 23·69 | 23·32 | 81·14 |
| 37. Latium | 447 | 1874–79 (6) | 12·61 | 16·05 | 22·08 | 20·60 | 71·34 |
| 51. Spring Vale | 500 | 1872–79 (7⅜) | 14·36 | 20·27 | 30·34 | 23·37 | 88·34 |
| 61. Windsor | 20 | 1865–79 (14⅓) | 6·75 | 19·06 | 21·44 | 19·87 | 67·12 |
| 29. Hampstead | 600 | 1857–62 (5⅔) | 7·90 | 17·28 | 17·50 | 15·57 | 58·25 |
| **Régime II. (as at Lyon).**—*Gradual increase from Winter to Autumn.* | | | | | | | |
| 44. Orange Cove | 20 | 1872–79 (7½) | 10·51 | 14·44 | 21·79 | 22·09 | 68·83 |
| 34. Irwin | 400 | 1870–79 (9⅔) | 10·63 | 14·13 | 15·73 | 20·80 | 61·29 |
| 23. Gales Valley | 300 | 1875–79 (5) | 12·04 | 12·57 | 17·84 | 17·89 | 60·34 |
| 33. Hyde | 700 | 1870–79 (9⅔) | 16·41 | 17·76 | 18·15 | 22·14 | 74·46 |
| 26. Golden Grove | ? | 1875–79 (4) | 12·83 | 15·93 | 16·99 | 19·27 | 65·02 |
| 3. Black River | 4 | 1870–79 (9) | 5·89 | 12·49 | 15·05 | 19·82 | 53·25 |
| 22. Fullerswood Park | 25 | 1874–79 (6) | 5·28 | 12·24 | 12·75 | 18·65 | 48·92 |
| 39. Mandeville | 2130 | 1870–79 (9⅔) | 9·68 | 21·50 | 23·14 | 33·82 | 88·14 |
| 40. Marshall's Pin | 2000 | 1876–79 (4) | 10·86 | 23·61 | 26·20 | 26·94 | 87·61 |
| 60. Whitney | ? | 1875–79 (5) | 8·12 | 21·72 | 29·20 | 30·94 | 89·98 |
| 47. Pennants | 718 | 1876–79 (4) | 7·44 | 20·66 | 25·82 | 28·13 | 82·05 |
| 13. Chapelton | 1000 | 1870–79 (6⅔) | 8·34 | 14·90 | 19·57 | 25·83 | 68·64 |
| 17. Denbigh | 198 | 1862–79 (17½) | 5·39 | 13·46 | 14·71 | 20·14 | 53·70 |
| 28. Halse Hall | 258 | 1874–79 (5½) | 6·00 | 18·46 | 19·73 | 23·21 | 67·40 |
| 20. Ewing's Caymanas | 50 | 1871–79 (9) | 6·06 | 11·82 | 13·45 | 21·16 | 52·49 |
| 53. Stony Hill | 1425 | 1870–79 (5½) | 11·18 | 19·29 | 23·47 | 34·51 | 88·45 |
| 41. Monaltrie | 250 | 1872–79 (8) | 5·14 | 8·00 | 12·62 | 24·55 | 50·31 |
| ... Up Park Camp | 225 | 1872–80 (8) | 9·36 | 10·94 | 12·38 | 17·98 | 50·66 |
| 31. The Hope Reservoir | 650 | 1871–79 (8) | 7·07 | 10·89 | 15·65 | 22·38 | 55·99 |
| 35. Kingston | 60 | 1870–79 (9) | 5·13 | 7·48 | 11·36 | 19·21 | 43·18 |
| 46. Palisadoes Plantation | ? | 1876–79 (4) | 4·85 | 9·33 | 18·76 | 19·00 | 51·94 |
| 48. Plumb Point Light | 9 | 1870–79 (9⅔) | 3·77 | 6·71 | 11·28 | 17·76 | 39·52 |
| **Régime III. (as at Mende).**—*Winter and Summer dry, Autumn very wet.* | | | | | | | |
| 15. Content | 770 | 1872–79 (8) | 13·59 | 14·39 | 11·85 | 15·63 | 55·46 |
| 55. Tilston | ? | 1875–79 (4⅓) | 12·59 | 15·92 | 14·72 | 15·99 | 59·22 |
| 38. Lottery | 700 | 1870–79 (10) | 12·03 | 12·51 | 9·75 | 15·82 | 50·11 |
| 25. Gibraltar | 700 | 1870–77 (7½) | 12·15 | 13·52 | 12·38 | 19·62 | 57·67 |
| 57. Unity Valley | 1170 | 1875–79 (5) | 20·71 | 21·34 | 20·94 | 23·06 | 86·05 |
| 12. Cave Valley | 1800 | 1871–79 (9) | 8·36 | 20·99 | 19·59 | 23·03 | 71·97 |
| ... Newcastle | 3800 | 1871–80 (8½) | 20·92 | 24·83 | 24·02 | 44·44 | 114·21 |
| 14. Cinchona Plantation | 4850 | 1871–79 (9) | 26·99 | 27·89 | 19·29 | 47·45 | 121·62 |
| 42. Morant Point Light | 12 | 1870–79 (9⅔) | 15·04 | 15·30 | 15·18 | 29·76 | 75·28 |
| 2. Ashley Hall | 75 | 1871–75 (5) | 4·30 | 10·35 | 8·23 | 20·96 | 43·84 |
| **Régime V. (as at Limoges).**—*Winter & Autumn very wet, Spring & Summer rather dry.* | | | | | | | |
| 49. Running Gut | 50 | 1871–79 (9) | 10·92 | 9·26 | 5·76 | 14·24 | 40·18 |
| 54. Success | 20 | 1871–79 (9) | 10·21 | 9·82 | 6·15 | 14·01 | 40·19 |
| 45. Orange Valley | 300 | 1875–79 (5) | 14·35 | 11·18 | 9·21 | 13·28 | 48·02 |
| 27. Green Park | ? | 1869–79 (10⅓) | 12·63 | 12·35 | 8·87 | 16·78 | 50·63 |
| 19. Dundee | 500 | 1875–79 (5) | 14·34 | 11·77 | 12·53 | 17·23 | 55·87 |

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RÉGIME V.—*(continued.)*

| Stations. | Height. ft. | Years. | Winter. in. | Spring. in. | Summ'r. in. | Aut'mn. in. | Year. in. |
|---|---|---|---|---|---|---|---|
| 21. Falmouth | 10 | 1870–79 (9) | 10·65 | 10·34 | 6·50 | 14·29 | 41·78 |
| 36. Lancaster | 100 | 1870–79 (10) | 15·01 | 11·56 | 8·83 | 16·72 | 52·12 |
| 24. Georgia | 700 | 1870–79 (10) | 15·96 | 12·60 | 10·50 | 15·47 | 54·53 |
| 58. Vale Royal | 900 | 1870–79 (10) | 17·41 | 13·55 | 12·31 | 17·94 | 61·21 |
| 4. Braco | 90 | 1870–79 (10) | 14·42 | 11·22 | 8·66 | 15·49 | 49·79 |
| 7. Bryan Castle | 850 | 1870–79 (9½) | 14·86 | 11·31 | 8·48 | 15·83 | 50·48 |
| 6. Brampton Bryan | 900 | 1870–79 (9½) | 14·20 | 12·09 | 10·66 | 16·05 | 53·00 |
| 32. Hopewell | 900 | 1872–79 (8) | 19·18 | 13·82 | 13·28 | 19·16 | 65·44 |
| 52. Steelfield | 700 | 1870–79 (9½) | 14·79 | 12·42 | 11·60 | 16·23 | 55·04 |
| 30. Harmony Hall | ? | 1870–79 (10) | 14·00 | 9·37 | 6·35 | 15·21 | 44·93 |
| 18. Drax Hall | 50 | 1870–79 (10) | 20·39 | 14·21 | 9·98 | 22·57 | 67·15 |
| 5. Bradfield | 1650 | 1865–79 (14½) | 23·72 | 19·19 | 14·19 | 27·02 | 84·12 |
| 1. Albion | 2000 | 1865–79 (14½) | 17·52 | 16·99 | 15·56 | 23·97 | 74·04 |
| 43. New Ramble | 700 | 1875–79 (5) | 22·51 | 18·40 | 13·57 | 24·65 | 79·13 |
| 59. Water Valley | 100 | 1875–79 (5) | 24·65 | 17·70 | 13·55 | 25·79 | 81·69 |
| 10. Castleton Gardens | 700 | 1871–79 (8) | 24·97 | 23·15 | 26·04 | 34·39 | 108·55 |

The prefixed reference numbers are those assigned to the respective stations in Mr. Maxwell Hall's official tables, "Jamaica Rainfall from about 1870 to 1879," published in the *Jamaica Gazette*.

## ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday evening, January 21st, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. The Secretary read the report of the Council, which showed the Society to be in a very satisfactory condition. The Council equipped a typical climatological station in the grounds of the International Health Exhibition, in order that persons desirous of organizing a station might see one arranged in accordance with the regulations of the Society. A Conference on Meteorology in relation to Health was arranged for by the Society, and held at the Health Exhibition on July 17th and 18th. The Council have appointed committees to investigate the subjects of the brilliant sunrises and sunsets of 1883-4, and of the local phenomenon known as the Helm Wind of Cross Fell, Cumberland. The observing stations of the Society now number 85, the results from which are printed in the *Meteorological Record*. The whole of the stations in the south of England have been inspected during the year, and found to be generally in a satisfactory state. The number of Fellows on the roll of the Society is 552, of whom 37 were elected in 1884.

The President, Mr. R. H. Scott, then delivered his address, in which he reviewed the distribution of meteorological observatories, and exhibited a large map, showing all the observing stations over the globe, and also the distribution of information as to ocean meteorology existing in the Meteorological Office. He said that there were now six Meteorological Societies publishing journals, and in addition six periodicals almost exclusively devoted to the science. He went on to say, "With all this wealth of literature



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there is one particular in which, in this country at least, our science labours under a great disadvantage. As far as I am aware, no instruction is given in it, except at the Royal Naval College, Greenwich. In Germany, in the current half year, no less than eleven courses of lectures are announced at as many Universities or High Schools." Mr. Scott then proceeded to treat of the general state of the science of meteorology over the globe, as compared with the programme sketched out by Prof. James Forbes in the Report of the British Association, 1840, and considered the different kinds of observations proposed by Prof. Forbes for various classes of stations and the degree to which his suggestions had been carried out. The next subject was the attempts which have been made by balloon ascents, mountain stations, &c., to gain a knowledge of the condition of the upper atmosphere, and Mr. Scott stated that on enquiry from the various foreign institutions which possessed affiliated mountain stations he had found that except in the case of Mount Washington, none of the observations were practically much used in forecasting. No telegrams are received from Pike's Peak. In one particular all authorities are agreed that, owing mainly to the uncertainty about their reduction to sea level from great heights, no one has yet suggested any mode in which the barometrical readings could be used. Mr. Scott concluded his address with a notice of the important work by Padre Vines, S.J., of the Havannah, on the "West Indian Hurricanes of 1876 and 1877."

The following gentlemen were elected the Officers and Council for the ensuing year :—

*President.*—Robert Henry Scott, M.A., F.R.S., F.G.S.

*Vice-Presidents.*—William Morris Beaufort, F.R.A.S., F.R.G.S., John Knox Laughton, M.A., F.R.A.S., F.R.G.S., Edward Mawley, F.R.H.S., Charles Theodore Williams, M.A., M.D., F.R.C.P.

*Treasurer.*—Henry Perigal, F.R.A.S.

*Trustees.*—Hon. Francis Albert Rollo Russell, M.A., Stephen William Silver, F.R.G.S.

*Secretaries.*—George James Symons, F.R.S., John William Tripe, M.D., M.R.C.P.Ed.

*Foreign Secretary.*—George Matthews Whipple, B.Sc., F.R.A.S.

*Council.*—Edmund Douglas Archibald, M.A., George Chatterton, M.A., M.Inst.C.E., John Sanford Dyason, F.R.G.S., Henry Storks Eaton, M.A., William Ellis, F.R.A.S., Charles Harding, Richard Inwards, F.R.A.S., Baldwin Latham, M.Inst.C.E., F.G.S., Robert John Lecky, F.R.A.S., William Marcet, M.D., F.R.S., F.C.S., Cuthbert Edgar Peek, M.A., F.R.A.S., F.R.G.S., Capt. Henry Toynbee, F.R.A.S.

## POPULAR PROGNOSTICS.

*To the Editor of the Meteorological Magazine.*

SIR,—There need not be any mystery respecting the Staffordshire proverb. More than forty years ago I spent a year in the village of Tutbury, and paid frequent visits to the river Dove. Upon the occasion of sudden rains in spring, the river quickly flooded the meadows on each side, and carried with it a quantity of fish, with which it abounded. The flood generally subsided at this time of the

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year, as quickly as it had risen, and left many of the small fish upon the grass, which were considered good manure. Hence the proverb. There is another place in Staffordshire which bears a peculiar character both meteorologically and otherwise, viz., Wootton,* which Moll thus describes on page 222 :—

"As for this Moorland, it is so rugged, foul and cold a Tract, that the Snows continue long undissolved, and the neighbours have a Rhime concerning Wooton, a country village here, by which they intimate that God never was in this place, thus :—

"Wooton under Wever,
"Where God came never.

"For it stands under Wever-Hill, and it's an observation of the country people in these parts, that the west wind always produces rain, but that the east and south winds, which are wont to bring rain in other places, make fair weather here, unless the wind shifts about from west to south, and this they attribute to their propinquity to the Irish Sea."

Yours faithfully, C. L. PRINCE.

*The Observatory, Crowborough, January 17th, 1885.*

---

*To the Editor of the Meteorological Magazine.*

SIR,—The river Dove separates, during part of its course, the counties of Stafford and Derby, and the meadows upon its banks are very rich and fertile, and a flood in April always makes a very heavy hay crop, or splendid pastures for dairy or feeding purposes. Hence the origin of the couplets you quote in your January number, and they are often used in Staffordshire ; to speak of land being as rich as Dove bank is to signify that it is of the highest and best quality ; another common saying is that if you drop your walking stick at night in a meadow on Dove Bank, and do not find it at once, you will not the next day, as the grass will have grown over it by the next morning. Hay grown in Dove meadows also takes a most extraordinary amount of making, and is usually made up into large cocks and kept in them for some time to heat, then opened out again and exposed to sun and wind in order to make it dry enough not to fire in the stack ; which it would certainly do if cut and carried in the usual manner ; at all times the meadows are very green and fresh, and to a dairy farmer are of very great value, from the vast amount of keep, or hay, they will produce.

I do not know if you have received any replies on this subject, but I have often heard my father, who knew the district well, use the very couplet you quote, and you may accept it as authentic.

Yours faithfully, WILLIAM ARNOLD,
(Late of Tamworth.)

*Belvoir House, Woodhurst Road, Moseley, near Birmingham, January 21st, 1885.*

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* A Hamlet at the foot of the S.W. slope of the Weaver Hills ; it is in the parish of Ellastone. Wootton Hall was built by Inigo Jones, and was in 1766 the residence of Rousseau.—ED.

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## IS THE RAINFALL OF KANSAS INCREASING?

OUR excellent contemporary, *Science*,* in its 100th number, reports a lecture with the above title, given before the Kansas Academy of Sciences, on November 25th, by Prof. Snow.

We have not space to reprint the whole, but intend to give the opening paragraph, the principal results, and a few remarks upon them.

Before doing so, it may be well to mention the position and area of the state of Kansas. It lies west of the Mississippi, in about 39° N. lat., (*i.e.*, in that of Southern Spain) and in nearly the centre of the United States; its area is given by Hubbard as 88,318 square miles (about three-fourths of that of Great Britain and Ireland).

"Thirty years ago the territory of Kansas was not occupied by the white man, and, if we except a few acres cultivated by the Delaware Indians, no portion of her soil had been turned up by the plough. Her entire area was included within the vast and almost unknown region of the 'treeless plains' and the 'great American desert.' During that brief intervening period, more than a million people, chiefly of the agricultural class, have taken possession of her domain, and have already brought her to the very front rank of the states of the Union in the extent and value of her agricultural products. History affords no other instance of the permanent occupation of so extensive an area, previously unoccupied by man, by so large an agricultural population, in so short a space of time. Here, certainly, if human agency could anywhere affect climate, would such an effect be produced. Here, assuredly, if settlement ever increases rainfall, will such increase be most marked and most unmistakable. That such increase has actually taken place, I believe to be established beyond a doubt. It is a circumstance peculiarly favourable to the determination of the point in question, that, although the general settlement of Kansas by cultivators of the soil is of such recent date, reliable observations upon the rainfall had been made at the military posts upon the eastern borders for a sufficient period to make possible a satisfactory comparison between the rainfall before settlement and after settlement. The records at Fort Leavenworth cover the longest period, and enable us to compare the nineteen years immediately preceding the occupation of Kansas by white settlers, with the nineteen years immediately following such occupation. During the first period the average rainfall was 30·96 inches; during the second period it was 36·21 inches; giving an average increase of 5·21 inches per annum†—an increase of nearly twenty per cent. The Fort Leavenworth records cover so long a period of time (nearly forty years), that the increased average of the second half of the period cannot be attributed to a mere 'accidental variation.' In the issue of *Science* for April 18, 1884, it is stated that 'the supposed increase in the rainfall in the dry region beyond the Mississippi is not borne out by the returns of the signal-service.' But the records of the signal-service upon which this statement was based include a period of only twelve years of observation

* The Science Company, Cambridge, Massachusetts.

† There is here an error, either in arithmetic or printing, of ·04, but the amount is too small to affect the question; we have taken 5·25 as the true value.—ED. *M.M.*

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(from 1871 to 1882), which is undoubtedly too short a period for either establishing or disproving the fact of a 'secular' variation."

Prof. Snow then mentions that there are other rather long registers in the State, and that they lead to similar results. No table is given, but it will save much space to throw his statements into that form.

| Station. | Total years observed. | Excess of rainfall in the second half of the foregoing period. in inches. | Per cent. |
|---|---|---|---|
| Fort Leavenworth | 38 | 5·25 | 17 |
| Fort Riley | 20 | 3·05 | 13 |
| Manhattan | 24 | 5·61 | 20 |
| Lawrence | 17 | 3·06 | 9 |

The position of Kansas renders the thorough examination of these facts most important, and we hope that we may be able to induce Prof. Snow to favour us with the whole of the yearly totals which he has used, and with all obtainable information as to the life history of each station, removals and renewals of the various gauges, &c. We shall readily give all necessary space in order that the question may be thoroughly examined. Experience with the long registers kept in the Old World has convinced us of the difficulty of being sure that differences such as the above are real—*i.e.*, are due to general increase, and not to casual wet or dry periods, or increased accuracy in modes of measurement, removal of gauges from roof tops to ground level, and similar apparently slight changes.

The question is of general importance; it does not concern Kansas alone, and we hope to have Prof. Snow's help in examining it as thoroughly as is possible.

---

## SNOW ROLLERS.

*To the Editor of the Meteorological Magazine.*

Sir,—On the 13th inst. a large number of "Snow Rollers" were formed here, and as I see from a letter in *Nature*, vol. xxvii., p. 507, that the phenomenon has not often been noticed in England, you may think the circumstance worth recording. I first noticed a few on the 12th, the snow being about 0·5 in. deep, and a strong N. wind blowing; more snow fell in the night and next morning, to a depth of rather more than three inches, and on going out in the afternoon I found all the open fields strewn with a number of rollers, varying in size from that of a hen's egg to cylinders about nine inches in diameter, and about the same length. I did not see any in course of formation, but there were tracks in the snow leading up to them on the windward side. The snow was rather moist, temperature being about the freezing point, and lay light, three in. of snow yielding 0·11 in. of water at 9 a.m. A few of the larger ones were left next day, but the greater part had been blown away.

H. MELLISH.

*Hodsock Priory, Worksop, January 15th, 1885.*

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## PENTHEMERIC TABLES.

*To the Editor of the Meteorological Magazine.*

SIR,—I have invented a Table of Rain which I call a Penthemeric Table, a term which explains itself. It combines in some degree the compactness of a monthly table with the precision of a daily one. In a monthly table, though we have the total of the month, we have not information as to how that quantity of rain was distributed during the month. And in a daily table the eye is bewildered by the long columns and a great number of figures. In a Penthemeric Table you see at a glance what was the pluvial character of each month, what parts of the month were rainy, and what parts were dry.

I subjoin such a table for the rain that fell at Cottingham (East Riding, Yorkshire) last year.—Yours truly,

J. H. HILL.

*Hull.*

*Penthemeric Table of Rain at Cottingham in* 1884.

| Jan. | Feb. | March, | April. | May. | June. |
|---|---|---|---|---|---|
| 110 | 66 | 51 | 21 | 32 | 12 |
| 5 | 22 | 65 | 22 | 16 | 51 |
| 9 | 9 | 15 | 56 | 20 | 0 |
| 0 | 7 | 4 | 11 | 4 | 4 |
| 68 | 38 | 5 | 7 | 0 | 7 |
| 85 | 5 | 32 | 34 | 0 | 0 |
| 277 | 147 | 172 | 151 | 72 | 74 |
| **July.** | **August.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** |
| 36 | 0 | 26 | 8 | 25 | 62 |
| 66 | 31 | 47 | 27 | 17 | 24 |
| 17 | 10 | 1 | 43 | 5 | 43 |
| 3 | 6 | 1 | 0 | 34 | 115 |
| 27 | 2 | 32 | 13 | 11 | 20 |
| 24 | 76 | 14 | 17 | 28 | 1 |
| 173 | 125 | 121 | 108 | 120 | 265 |

N.B.—Each number represents the hundredths of an inch of rain of five days, except the last number in the month, which relates in some cases to six days, and in February only to three.

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## THE NEW TIME.

*To the Editor of the Meteorological Magazine.*

SIR,—I do not think that *Bradshaw* should be blamed for using the old time, for though no doubt if *Bradshaw* were to adopt the new time the general public would soon follow, yet as the change really depends on the railway companies, should not the first step towards its adoption by the public, through *Bradshaw*, be for the companies to agree *among themselves* to use the new time of day? Seing that only one company has done so, and that a small one, surely it was natural for *Bradshaw* to convert its figures back again for the sake of uni-

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formity. It would never do to have part of that publication to be printed in one time and part in the other, the only alternative for *Bradshaw* being to convert the old time into the new in the case of all the other companies, and this would be inconvenient as long as the railway companies themselves in their own time-tables and by their officers use the old time. I think that what is really peculiar is that neither meteorologists nor other scientific men nor any authorities have come to a decision as to the date at which the adoption of the new time should take effect.—Yours truly,

T. W. BACKHOUSE.

[We at once accept Mr. Backhouse's correction. It was for the general managers in meeting assembled to consider the subject, and probably they have decided—upon making no change. But our argument remains where it was, except that for the word "Bradshaw" we should have written "railway managers."

It seems to us that, as with many other things, this proposal having been snubbed and shelved at the proper moment, it is to be definitely driven into the limbo of unadopted improvements; one of the most recent arguments proving conclusively (to the arguer's mind, not to ours) that it cannot possibly be adopted before 1890. That it will not be adopted even then we are inclined to believe, for having been checked just when the public were taking up the idea, it will not be easy to arouse them a second time to the advantages of the change. We believe that its adoption for meteorological purposes would be beneficial, but, before adopting it, shall wait until we hear the decision of the Royal Meteorological Society upon the question.—ED.]

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## DRY DATES IN 1884.

*To the Editor of the Meteorological Magazine.*

SIR,—On looking over the record of "Rainfall" of 1884, there is one feature which is singular, and I think worthy of notice. I allude to the absence of rain on the 16th and 17th of the month, and it would be interesting to know whether it is peculiar to this district, or has prevailed in other parts.

On January 16th, ·01 was recorded, and ·13 on December 16th, no rain having been registered on the 16th of any one of the ten intervening months; on the 17th of July, ·02 was recorded, and no rain on the 17th of the other eleven months of the year.

On examining records of rainfall of past years, not here, but at Muswell Hill, I find the year 1874 also a dry one, like 1884, shows a somewhat similar characteristic, but not to the same extent, on the 20th of the month of that year, ·01 having fallen on January 20th, and ·03 on Sept. 20th, and no rain on the 20th of the other ten

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months, and though rain fell on the 21st of four months of that year, the amounts were very small, being ·01, ·04, ·04, and ·03 only.

I am, Sir, yours faithfully,

J. W. SCOTT.

P.S.—Having access to the daily return of rainfall at Muswell Hill for the past year, I find that the amounts registered on the 16th of each month are exactly the same as here, but those of the 17th differ; ·04 fell on May 17th, ·07 on July 17th, and ·02 on November 17th.

*Springlands, Great Stanmore, Middlesex, Jan. 6th, 1885.*

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## IRIDESCENT BANDS.

*To the Editor of the Meteorological Magazine.*

SIR,—By a typographical error in the *Meteorological Magazine* of this month (p. 192, line 11), an incorrect idea is conveyed as to the remarkable phenomena observed here at sunrise on the 8th and 12th of December, placing a full stop after "it," and a capital T for "towards," making it read as if the openings towards the S.E. only, showed the prismatic colours, one of the most beautiful features in the phenomena was the three distinct bands of prismatic colours completely edging the openings. I should not have thought it worth while calling attention to this error, if it was not that the phenomenon appears not to have been observed before; it was noticed at a meeting of the Royal Society, Edinburgh, last month, and Prof. Tait, I understand, intends investigating it. I have not heard if he has done so yet. I do not think the peculiar and beautiful appearance can be assigned to ice Spiculæ.—I remain, Sir, yours trluy,

P. A. DUDGEON.

*January 17th, 1885.*

[The line was printed as follows :—

"several openings in it. Towards the S.E. these openings were, &c."

It should have been—

"several openings in it towards the S.E.; these openings were, &c."

We agree with Mr. Dudgeon as to the rarity of the appearance. We may, however, refer those interested to Herschell's *Meteorology*, 1861, p. 224.—ED.]

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LIGHTNING CONDUCTORS IN SCANDINAVIA.—Professor Mohn, of Christiania, who was commissioned by the Swedish Government to hold an official inquiry as to the degree of protection afforded by lightning conductors, ascertained that lighthouses, telegraph stations, and other bulidings, very much exposed, but provided with lightning conductors, suffered considerably less than the churches, which are in Norway generally not protected against lightning. Out of 100 churches struck, only three were provided with lightning conductors. In one, the conductor of which was in good condition no damage was done. In the second, the conductor, which was of zinc, was melted. In the third, the conductor was eaten by rust where it entered the soil; and the church was set on fire.—*Electrician.*

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## DENTON'S UNCHANGEABLE THERMOMETERS.

Meteorologists have long been familiar (unpleasantly so) with the fact that mercurial thermometers read higher the older they are. The largest proportion of the total rise takes place immediately after they are made, and consequently it has for many years been the practice of the best opticians to make and fill the tubes long before putting on the divisions; in some cases, we believe, that tubes are laid by for as long as three years. Even after that period a slight rise occurs, and this "shifting of the zero point," as it is called, renders necessary from time to time the re-determination of the index error.

Mr. Denton exhibited to the Meteorological Society on November 15th, 1882, a number of thermometers, which, by some special process in construction, he stated were not liable to change; and in proof thereof produced certificates of the thermometers showing that although verified within a few months of their being made, there had, within a twelvemonth, been scarcely a rise of 0°·1.*

Mr. Denton sent these same thermometers to the Health Exhibition. The Jury selected six (four ordinary and two clinical), and sent them to Kew for a fourth verification. The results were so satisfactory that they awarded a silver medal. We annex a table of the results of each verification, which show that the change never exceeds 0°·2, is generally 0°·1 and frequently *nil*.

| No. of Thermometer. | Date of Verification. | CORRECTIONS AT 32° | 42° | 52° | 62° | 72° | 82° | 92° | Mean. |
|---|---|---|---|---|---|---|---|---|---|
| 19328 | June, 1881..... | ·0 | ·0 | —·1 | ·0 | ·0 | ·0 | ·0 | —·014 |
| | January, 1882.. | —·1 | —·2 | —·2 | —·1 | —·1 | —·1 | —·1 | —·103 |
| | June, 1882..... | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·100 |
| | July, 1884 ..... | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·100 |
| 19329 | June, 1881..... | ·0 | ·0 | —·1 | ·0 | ·0 | ·0 | ·0 | —·014 |
| | January, 1882.. | —·2 | —·2 | —·2 | —·1 | —·1 | —·2 | —·1 | —·157 |
| | June, 1882..... | —·2 | —·1 | —·1 | —·1 | —·1 | —·2 | —·1 | —·128 |
| | July, 1884 ..... | —·2 | —·1 | —·1 | —·1 | —·1 | —·2 | —·1 | —·128 |
| 19332 | June, 1881..... | ·0 | ·0 | —·1 | ·0 | ·0 | —·1 | —·1 | —·043 |
| | January, 1882.. | —·1 | —·2 | —·2 | —·1 | —·1 | —·1 | —·1 | —·128 |
| | June, 1882..... | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·100 |
| | July, 1884 ..... | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·1 | —·100 |
| 19336 | June, 1881..... | ·0 | —·1 | ·0 | ·0 | ·0 | ·0 | ·0 | —·014 |
| | January, 1882.. | —·2 | —·3 | —·2 | —·2 | —·2 | —·2 | —·1 | —·200 |
| | June, 1882..... | —·1 | —·2 | —·2 | —·2 | —·2 | —·1 | —·1 | —·157 |
| | July, 1884 ..... | —·1 | —·2 | —·2 | —·2 | —·2 | —·1 | —·1 | —·157 |

*Met. Mag.*, vol. xvii. p. 168 (December, 1882.).

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1884.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 81·7 | 27 | 40·6 | 1 | 69·7 | 50·0 | 49·5 | 73 | 107·3 | 45·7 | 2·84 | 7 | 6·4 |
| Malta | 79·2 | 30 | 57·4 | 14 | 74·9 | 62·7 | 59·7 | 75 | 137·8 | 52·5 | ·54 | 4 | 3·9 |
| *Mauritius* | 77·7 | 1 | 57·4 | 4 | 75·3 | 64·9 | 61·1 | 75 | 122·5 | 46·2 | 1·06 | 13 | 4·4 |
| Calcutta | 94·5 | 5 | 70·2 | 6 | 90·3 | 76·7 | 77·2 | 84 | 158·9 | 67·4 | 11·72 | 19 | 6·3 |
| Bombay | 92·1 | 10 | 75·6 | 20 | 88·6 | 79·4 | 76·7 | 78 | 143·9 | 73·8 | 13·25 | 16 | 5·5 |
| Ceylon, Colombo | 86·2 | 9 | 74·8 | 30 | 84·7 | 78·4 | 73·7 | 77 | 141·2 | 65·2 | 7·39 | 17 | 7·5 |
| *Melbourne* | 68·1 | 2 | 34·0 | 30 | 58·2 | 43·9 | 43·1 | 77 | 111·0 | 28·2 | ·84 | 10 | 6·1 |
| *Adelaide* | 72·2 | 3 | 39·6 | 30 | 60·0 | 47·9 | 46·3 | 75 | 128·9 | 32·2 | 4·56 | 23 | 5·8 |
| *Wellington* | ... | ... | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... |
| *Auckland* | 63·0 | 12 | 37·0 | 1 | 57·9 | 48·1 | 46·6 | 78 | 115·0 | 29·0 | 4·23 | 18 | 6·7 |
| Jamaica, Kingston | 90·4 | 7 | 70·5 | 2 | 86·8 | 73·3 | 73·1 | 80 | ... | ... | 1·77 | ... | 7·1 |
| Barbados | 84·0 | 1 | 71·0 | var. | 82·0 | 73·0 | 71·7 | 84 | 153·0 | 69·0 | 5·68 | 13 | 6·0 |
| Toronto | 84·3 | 23 | 42·9 | 1 | 75·9 | 53·4 | 56·4 | 72 | 144·0 | 35·8 | 2·20 | 8 | 6·8 |
| New Brunswick, Fredericton | 92·7 | 29 | 33·0 | 1 | 76·6 | 48·6 | 51·0 | 66 | ... | ... | 4·23 | 15 | 4·3 |
| Manitoba, Winnipeg | 88·5 | 22 | 39·2 | 9 | 74·7 | 54·8 | 57·1 | 73 | ... | ... | 2·53 | 8 | 6·8 |
| British Columbia, Spence's Bridge | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

### Remarks, June, 1884.

Malta.—Mean temp., 68°·0; mean hourly velocity of wind, 10·3 miles, on 19th velocity averaged 26 miles for 4 hours; sea temp. rose from 70° to 74°. The after-glow at sunset continued, and was of a pale rose colour. J. Scoles.

*Mauritius.*—Rainfall 0·86 in., and mean temp. 0°·6 below their respective averages; max. velocity of wind 27·1 miles on 23rd, min. 2·3 miles on 4th; prevailing direction S.E. to E. Coloured skies before sunrise and after sunset every day, beginning 1h. 14m. before sunrise, and ending 1h. 14m. after sunset. Prevailing colours orange and yellow, much less intense than in September to January last. C. Meldrum, F.R.S.

Ceylon.—Thunderstorms occurred on five days. J. H. Symonds.

*Melbourne.*—Mean temp. 0°·7 above average; temp. of dew-point, humidity, amount of cloud and pressure all more or less below it; total rain 1·13 in. below it Prevailing winds N. and N.E., strong breezes on eight days. Heavy dew on six days; hoar frost on three days. R. L. J. Ellery, F.R.S.

*Adelaide.*—Mean pressure the lowest in January since 1875; mean temp. slightly above the average; the max. on 3rd being the highest in June since 1865. Rainfall 1·96 in. above the average. The Zodiacal light was visible on three evenings, and the red glow was seen shortly after sunset on most clear evenings. C. Todd.

*Auckland.*—From 1st to 7th fine, with light S. and E. winds, and sharp frosts on 1st, 2nd, and 3rd; from 8th to the 20th unsettled and showery with N.E. gales; from 25th to end of month, squally and showery with light S.W. winds. Pressure above the average; mean temp. and rainfall a little below it. T. F. Cheeseman.

Barbados.—Mean temp., 76°·8, 0°·5 below the average. Wind N.E., mean hourly velocity 11·5 miles, which is about the average; extremes 16·5 miles and 7 miles. Rainfall 1 per cent. above the average; four days were overcast.

R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·57 | XI. | Rhayader, Nantgwillt.. | 6·64 |
| ,, | Margate, Birchington... | 2·07 | ,, | Carno, Tybrith ... ..... | 4·83 |
| ,, | Littlehampton ..... | 1·45 | ,, | Corwen, Rhug ..... | 1·17 |
| ,, | Hailsham ..... | 2·64 | ,, | Port Madoc ..... | 4·15 |
| ,, | I. of W., St. Lawrence. | 2·15 | ,, | I. of Man, Douglas ..... | 3·43 |
| ,, | Alton, Ashdell..... | 3·36 | XII. | Stoneykirk, Ardwell Ho. | 1·68 |
| III. | Winslow, Addington ... | 2·04 | ,, | Melrose, Abbey Gate... | 2·54 |
| ,, | Oxford, Magdalen Col... | 2·17 | XIII. | N. Esk Res. [Penicuick] | 2·50 |
| ,, | Northampton ..... | 1·42 | XIV. | Ayr, Cassillis House ... | 2·53 |
| ,, | Cambridge, Beech Ho... | 1·58 | ,, | Glasgow, Queen's Park. | 2·45 |
| ,, | Wisbech, Bank House.. | 1·42 | XV. | Islay, Gruinart School.. | 5·14 |
| IV. | Southend ..... | 1·27 | XVI. | St. Andrews, Newton Bk. | 1·18 |
| ,, | Harlow, Sheering ... .. | 1·48 | ,, | Balquhidder, Stronvar.. | 7·08 |
| ,, | Rendlesham Hall ..... | 2·03 | ,, | Dunkeld, Inver Braan.. | 3·24 |
| ,, | Diss ..... | 2·46 | ,, | Dalnaspidal H.R.S. ... | 4·65 |
| ,, | Swaffham ..... | 2·81 | XVII. | Keith H.R.S. ..... ..... | 1·43 |
| V. | Salisbury, Alderbury... | 2·76 | ,, | Forres H.R.S. ..... ... | 1·07 |
| ,, | Warminster ..... | 3·22 | XVIII. | Strome Ferry H.R.S.... | 4·36 |
| ,, | Calne, Compton Bassett | 2·78 | ,, | Lochbroom ..... | 3·78 |
| ,, | Ashburton, Holne Vic.. | 5·81 | ,, | Tain, Springfield..... | 1·48 |
| ,, | Holsworthy, Clawton... | 2·67 | ,, | Loch Shiel, Glenaladale | 6·84 |
| ,, | Hatherleigh, Winsford. | 2·60 | ,, | Invergarry ..... | 5·13 |
| ,, | Lynmouth, Glenthorne. | 3·69 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Probus, Lamellyn ..... | 3·36 | ,, | Forsinard H.R.S. ..... | 1·61 |
| ,, | Wincanton, Stowell Rec. | 3·13 | ,, | Watten H.R.S. ..... | 1·57 |
| ,, | Taunton, Fullands ..... | ... | XX. | Dunmanway, Coolkelure | 8·07 |
| VI. | Bristol, Clifton ..... .. | 2·73 | ,, | Fermoy, Gas Works ... | 3·52 |
| ,, | Ross ..... | 2·95 | ,, | Tralee, Castlemorris ... | 3·14 |
| ,, | Wem, Sansaw Hall..... | 1·85 | ,, | Tipperary, Henry Street | 4·12 |
| ,, | Cheadle, The Heath Ho. | 1·83 | ,, | Newcastle West ..... | 3·73 |
| ,, | Worcester, Diglis Lock | 1·59 | ,, | Miltown Malbay..... | 3·71 |
| ,, | Coventry, Coundon ..... | 2·03 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 1·61 | XXI. | Carlow, Browne's Hill.. | 3·08 |
| ,, | Ketton Hall [Stamford] | 1·23 | ,, | Navan, Balrath ..... | 1·53 |
| ,, | Horncastle, Bucknall ... | 1·81 | ,, | Mullingar, Belvedere ... | 2·55 |
| ,, | Mansfield, St. John's St. | 2·22 | ,, | Athlone, Twyford ..... | 2·34 |
| VIII. | Macclesfield, The Park | 2·18 | XXII. | Galway, Queen's Col.... | 2·87 |
| ,, | Walton-on-the-Hill..... | 1·66 | ,, | Clifden, Kylemore ..... | 10·46 |
| ,, | Lancaster, South Road. | 2·33 | ,, | Crossmolina, Enniscoe.. | 5·23 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 3·27 |
| IX. | Wakefield, Stanley Vic. | ·92 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·31 | ,, | Rockcorry..... | ... |
| ,, | Scarborough..... | 1·97 | ,, | Warrenpoint ..... | 2·81 |
| ,, | East Layton [Darlington] | 1·86 | ,, | Newtownards ..... | 1·69 |
| ,, | Middleton, Mickleton.. | 2·95 | ,, | Belfast, New Barnsley . | 3·03 |
| X. | Haltwhistle, Unthank.. | 1·68 | ,, | Cushendun ..... | 2·52 |
| ,, | Shap, Copy Hill ..... | 5·03 | ,, | Bushmills ..... ..... | ... |
| XI. | Llanfrechfa Grange . .... | 3·71 | ,, | Stewartstown ..... | 2·73 |
| ,, | Llandovery ..... | 4·48 | ,, | Buncrana ..... | 2·94 |
| ,, | Castle Malgwyn ..... | 3·89 | | | |

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# JANUARY, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max Deg. | Date | Min. Deg. | Date. | No. of Nights below 32° In shade | On grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·48 | — ·92 | ·31 | 10 | 16 | 53·3 | 29 | 22·8 | 22 | 19 | 2 |
| II. | | Maidstone (Hunton Court)... | 2·47 | — ·10 | ·49 | 31 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 2·98 | + ·43 | 1·01 | 31 | 14 | 55·0 | 29 | 21·7 | 20 | 20 | 2 |
| III. | | Hitchin ..... | 2·25 | + ·03 | ·59 | 31 | 15 | 51·0 | 29 | 19·0 | 21 | 25 | ... |
| ,, | | Banbury ..... | 1·75 | — ·63 | ·22 | 9, 30 | 18 | 51·0 | 28*b* | 20·5 | 22 | 25 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·82 | + ·98 | ·93 | 12 | 18 | 54·0 | 29 | 23·0 | 22 | 21 | ... |
| ,, | | Norwich (Cossey) ..... | 2·45 | + ·75 | ·49 | 10 | 16 | 53·5 | 29 | 20·0 | 14 | 21 | 2 |
| V. | | Weymouth(LangtonHerring) | 2·66 | ... | ·55 | 29 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 3·16 | — 1·10 | ·59 | 7 | 18 | 56·0 | 30 | 30·0 | 6 | ... | ... |
| ,, | | Bodmin ..... | 3·88 | — 2·63 | ·78 | 28 | 20 | 52·0 | 29 | 27·0 | 14 | 10 | 1 |
| VI. | | Stroud (Upfield) ..... | 2·47 | — ·45 | ·52 | 9 | 16 | 52·0 | 29 | 26·0 | 5 | 20 | ... |
| ,, | | ChurchStretton(Woolstaston) | 2·57 | — ·86 | ·56 | 28 | 16 | 50·5 | 29 | 24·0 | 22 | 21 | 2 |
| ,, | | Tenbury (Orleton) ... ..... | 2·06 | — ·93 | ·50 | 28 | 17 | 53·2 | 29 | 21·5 | 6 | 19 | 2 |
| VII. | | Leicester ... ..... | 1·78 | ... | ·31 | 10 | 18 | 52·2 | 29 | 22·5 | 22 | 17 | 2 |
| ,, | | Boston ..... | 1·86 | + ·14 | ·40 | 10 | 16 | 54·0 | 29 | 26·0 | 22 | 15 | ... |
| ,, | | Grimsby (Killingholme)..... | 2·05 | + ·29 | ·29 | 12 | 20 | 54·0 | 29 | 27·0 | 22 | 11 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·25 | ... | ·18 | 28 | 17 | 55·0 | 29 | 20·0 | 22 | 20 | ... |
| VIII. | | Manchester (Ardwick)..... | 1·81 | — 1·43 | ·54 | 10 | 10 | 52·0 | 29*c* | 24·0 | 22 | 18 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·13 | — ·09 | ·42 | 29 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 5·11 | — 1·82 | 1·29 | 28 | 20 | 50·0 | 29 | 27·0 | 22 | 17 | ... |
| X. | | North Shields ..... | 1·88 | + ·04 | ·58 | 11 | 15 | 54·8 | 29 | 27·4 | 22*e* | 14 | 1 |
| ,, | | Borrowdale (Seathwaite)..... | 11·36 | — 7·39 | 1·85 | 28 | 14 | 50·0 | 29 | 25·0 | 23 | 5 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 3·47 | — 1·24 | ·66 | 9 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 4·43 | — 1·84 | ·60 | 25 | 19 | 51·0 | 29*c* | 27·0 | 6 | 12 | 1 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 3·66 | ... | 1·15 | 9 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·33 | — 1·63 | ·18 | 9*a* | 15 | 55·2 | 29 | 27·0 | 21 | ... | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... ... | 3·68 | — 2·43 | ·84 | 28 | 14 | 49·2 | 29 | 24·2 | 22 | 16 | ... |
| ,, | | Jedburgh (Sunnyside)..... | ... | ... | ... | ... | ... | ... | ... | ... | .. | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 3·57 | — 1·87 | 1·27 | 31 | 13 | ... | ... | ... | .. | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·07 | — 2·80 | ·68 | 8 | 15 | ... | ... | ... | .. | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 4·65 | ... | 1·08 | 8 | 14 | 52·0 | 4 | 25·0 | 15 | 10 | ... |
| ,, | | Mull (Quinish)..... | 4·97 | ... | ·92 | 4 | 19 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·70 | — 1·12 | ·40 | 10*b* | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·59 | — ·86 | ·31 | 28 | 16 | 46·0 | 29*c* | 23·0 | 16 | 16 | ... |
| XVII. | | Braemar ..... | 2·87 | + ·09 | ·41 | 7 | 16 | 46·2 | 5 | 4·8 | 16 | 26 | 2 |
| ,, | | Aberdeen ..... ..... | 1·74 | ... | ·32 | 4 | 20 | 47·0 | 29 | 19·0 | 15 | 12 | ... |
| XVIII | | Skye (Sligachan) ..... | 10·17 | ... | 3·00 | 5 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... ..... | 1·47 | — ·30 | ... | ... | ... | 47·0 | 26 | 15·0 | 21 | 17 | 3 |
| XIX. | | Dunrobin ..... ..... | 2·17 | ... | ·42 | 10 | 11 | 50·0 | 5 | 22·0 | 21 | 18 | ... |
| ,, | | Orkney (Sandwick) ..... .. | 2·14 | — 1·20 | ·50 | 9 | 13 | 49·2 | 5 | 30·2 | 17 | 4 | 2 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 4·99 | — 1·03 | ·91 | 25 | 20 | 53·0 | 10*d* | 27·0 | 13 | 10 | ... |
| ,, | | Dromore Castle ..... | 6·62 | ... | 1·00 | 10*c* | 20 | 53·0 | 5 | 28·0 | 13 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·26 | ... | ·63 | 2 | 20 | 52·0 | 26 | 27·0 | 14 | 9 | 1 |
| ,, | | Killaloe ..... | 3·95 | ... | ·72 | 9 | 19 | 53·0 | 31 | 26·0 | 19 | 12 | ... |
| XXI. | | Portarlington ..... ..... | 2·37 | — ·69 | ·76 | 2 | 22 | 52·0 | 27 | 26·0 | 14 | 13 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·62 | — ·64 | ·32 | 7 | 23 | 53·7 | 29 | 29·0 | 13 | 5 | 1 |
| XXII. | | Ballinasloe ..... ..... | 2·73 | — 1·63 | ·40 | 31 | 22 | 50·0 | 26 | 24·0 | 14*f* | 18 | ... |
| XXIII | | Waringstown ..... | 1·97 | — 1·44 | ·31 | 27 | 18 | 56·0 | 29 | 24·0 | 12 | 13 | 1 |
| ,, | | Londonderry (Creggan Res.). | 2·69 | ... | ·37 | 10 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 2·90 | — ·87 | ·51 | 27 | 21 | 51·0 | 27 | 26·0 | 8 | 12 | 1 |

*a* And 28, 31. *b* And 29. *c* And 30. *d* And 26. *e* And 23. *f* And 19.
+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON JANUARY.

Abbreviations.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

Strathfield Turgiss.—The early part of the month was fair and cold, the latter part wet and stormy. A robin's nest with two eggs was found on 2nd, and on the 7th a nest of young sparrows; on 5th a female brimstone butterfly emerged from the pupa; thrushes heard on 23rd.

Culford.—The most noteable features of the month were the frequent high winds, the heavy fall of S on the 12th, and the numerous white frosts.

Langton Herring.—From the 12th to 22nd the weather was cold; most of the days were gloomy and foggy, and the range of temp. was small. The 30th and 31st were stormy, with vivid L and T on the latter day. The roaring of the sea on the 29th and 30th was very noticeable. Mean temp. 2° below the average.

Bodmin.—Mean temp. 39°·6.

Stroud.—A dry, pleasant month, but not much sun. S.S.W. gale on 29th. Sheet L in S.E. from 6 to 8 p.m. on 31st.

Woolstaston.—A seasonable month of winter weather, with sharp frost nearly every day till the 25th, when a rapid thaw set in. S fell on the 17th Mean temp. 35°·5.

Orleton.—The temp. of the first 11 days was variable, with occasional severe frosts, but as a whole was above the average; it then became much lower than the average and very steady, with a strong N. or E. wind till the 26th. The remainder of the month was warm and rainy. Mean temp. of the month about 1°·5 above the average. The rainfall was very small till the 24th, and the roads and fields were unusually dry, but after that date R fell every day. The sky was generally obscured by clouds, and from the 13th to the 27th the sun was only once seen for a few minutes. Strong winds prevailed nearly all the month. Frequent L was seen in S.W. on the night of the 31st.

Leicester.—The month was dry, but dull, with very little sunshine. Temp. very variable. S fell on 3 days, and there was much hoar frost.

Killingholme.—A seasonable month, though vegetation was more backward than in the preceding years, with signs of spring at the close; no heavy gales; much S on 12th and 13th.

Manchester.—The month was, on the whole, dry and not very wintry, although at times the temp. fell rather low. The weather, though not bright, was fairly free from fogs.

## WALES.

Haverfordwest.—The month commenced cold, stormy and wet; from the 5th to the 13th it rained every day, with cold, bleak air. S fell in considerable quantities on the 12th, covering the high ground in the N.E. and the Precelly range. S fell also on 13th and 17th. The weather from the 13th to the 23rd was very cold and frosty, accompanied by a bitter E. wind, which at times almost reached the force of a gale; the 21st was a very severe day with a gale from the E., overcast sky, and mean temp. for the 24 hours of 31°·1; from 19th to 23rd dark weather prevailed, the sun never being visible. Mean temp. of the month slightly below the average. L H and R on 11th. Remarkable spring tides prevailed on 3 or 4 days, and on 31st did much damage at Newgate; a strong W. gale caused the waves to break over the bank of pebbles which extends for fully 2 miles and rises 20 or 25 feet above the sands. Such an occurrence has not taken place since January, 1869.

Llandudno.—A month of rather chequered weather. The mean temp., however, was but little below the average; from the 11th to the 21st, inclusive, the wind blew from an easterly point, it was dull and hazy, but not a drop of

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R fell; after the latter date the weather was markedly milder, and the month went out with a heavy gale on the 31st. No frosts of great severity, not enough to kill or materially damage geraniums, veronicas, stocks and wallflowers. Snowdrops were blooming in abundance at the close.

## SCOTLAND.

CARGEN.—A very dull month, the hours of sunshine being only 35 as compared with an average of 62 hours. Mean temp. 36°·7, 1°·6 below the average. Strong gales on 7th, 10th and 31st.

OBAN.—There were, as in the preceding month, two distinct periods of R and an interval of frost, the latter being, in this case, much more marked and prolonged. So fine a January, and one so free from storms has not been experienced here for some years. S on 9th. H on 5th, 6th and 8th.

QUINISH.—The first 11 days were wet and stormy, followed by fine and frosty weather with bright sunshine till the 24th, after which mild damp weather prevailed to the close. Heavy gale, with T and L on the 6th.

ABERDEEN.—With the exception of a week of cold, frosty weather about the middle, the month was fine and open, with a rainfall considerably below the average. S fell on four days. Aurora was observed on only one night. Fresh gale from S. on 31st.

CULLODEN.—Very severe frost prevailed during the entire month, interrupting field labour. R fell only during the first and closing weeks.

## IRELAND.

DROMORE.—The month was very stormy at times, the later part being very wet and cold.

KILLALOE.—Rainfall moderate; frosts frequent but slight, weather generally very favourable for the time of year. Wind blew heavily from S.W. on night of 27th.

DUBLIN.—A dull month of average temp., with a remarkable prevalence of S.E. winds, densely clouded skies, and a deficient rainfall, scattered, however, over an excess of rainy days. The last few days were warm and very unsettled with squally S. winds, and frequent showers by night. The mean temp. (40°·8) was exactly equal to the average, and identical with that of the preceding month. Mean humidity 84; mean amount of cloud 6·8; prevailing winds S.S.E., S.E., and W.S.W. Solar halo on 5th; luuar on 27th; L on 31st; S or sleet on three days; H on three days; more or less fog on four days; lunar rainbow on 31st; gales on the 8th, 10th, 17th, 28th and 31st.

WARINGSTOWN.—The early part of the month was very dry, in fact up to the 26th it bade fair to be the driest January on record.

EDENFEL.—The unsettled rainy weather which prevailed up to the 12th gave way on that day to a light fall of S, followed by 10 days of calm, generally clear weather and light pleasant frosts, the temp. keeping between 36° and 26°. The last week was mild and showery, but generally clear and fine.

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# SCRAPS.

THUNDERSTORMS.—DR. S. HOPPE, of Hamburg, recently stated before the Congress of Medical Men and Physicists of that city, as the result of his experiments, that the flowing of a column of warm, moist air into a colder atmosphere will be followed by a thunderstorm if the electricity generated by the friction of the air is not diffused and neutralized by the condition of the surrounding atmosphere. It should not be forgotten that the vapour of water or of moist air has long been known to develope electrical disturbances.—*Athenæum, 24th January, 1885.*

THERMOMETER SCALES.—"A thermometer is not without honour, save in its own country," quotes a French paper, and proves it thus. In France, the thermometer in use is that of Celsius, a Swede; in Germauy and Russia, that of Réaumur, a Frenchman; in England and America, that of the German Fahrenheit; while the Swedes disown their countryman, and are guided by hat of Leslie, a Scotchman. [? as regards the last statement.—ED.]

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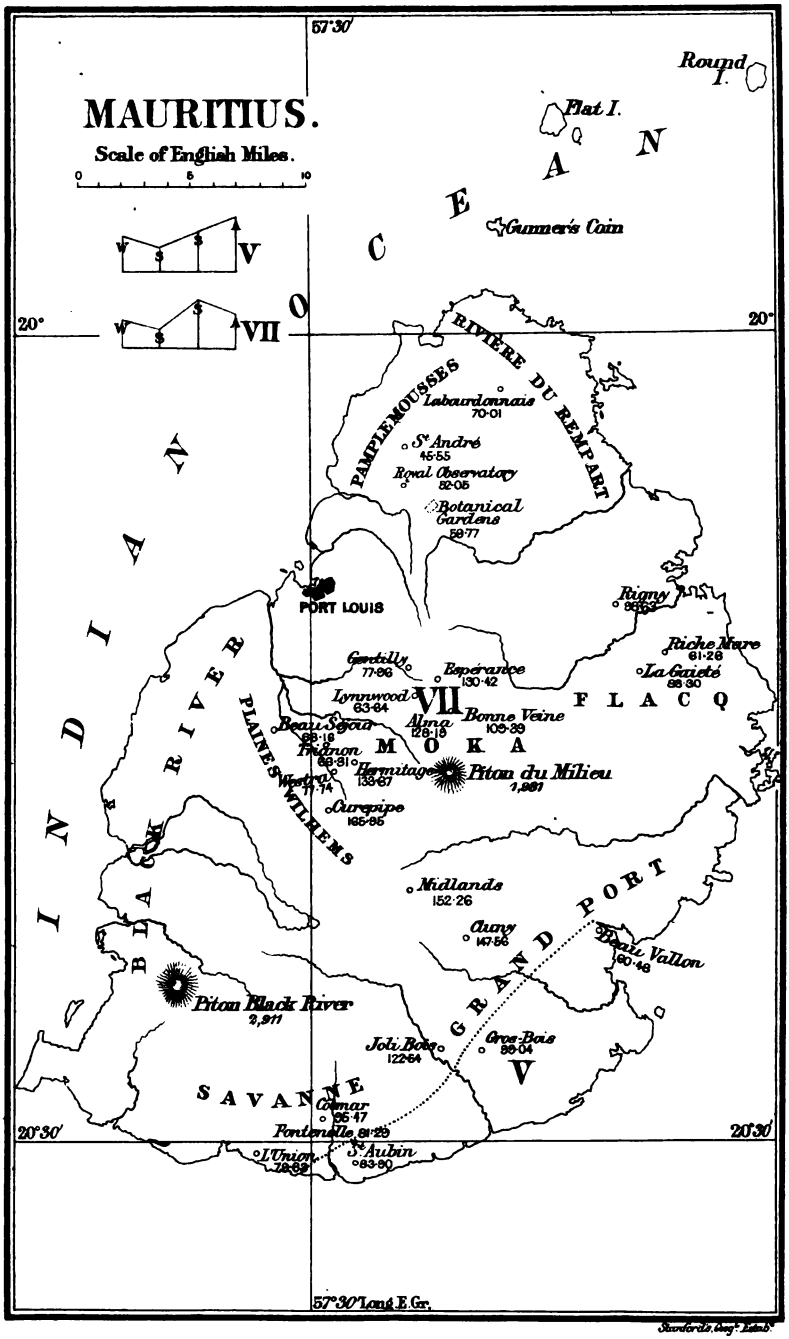
MAURITIUS.
Scale of English Miles.
0 5 10
57°30'
Round I.
Flat I.
Gunner's Coin
INDIAN OCEAN
20°
20°
RIVIÈRE DU REMPART
PAMPLEMOUSSES
Labourdonnais 70·01
St. André 45·55
Royal Observatory 82·05
Botanical Gardens 58·77
PORT LOUIS
Rigny
Riche Mare 61·26
La Gaieté 66·80
Gerbille 77·86
Espérance 130·42
Lynnwood 63·64
Beau Séjour 68·19
Pamplemousses 68·81
Wentworth 71·74
Hermitage 133·67
Piton du Milieu 1,961
Curepipe 165·85
PLAINES WILLEMS
RIVIÈRE NOIRE
BLACK
Midlands 152·26
Auny 147·56
Beau Vallon 60·48
GRAND PORT
Piton Black River 2,911
Joli Bois 122·64
Gros Bois 95·04
SAVANNE
Cluny 95·47
Fontenille 81·29
L'Union 78·69
St. Aubin 83·80
20°30'
20°30'
57°30' Long. E Gr.
Stanford, Geogr. Estab.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXX.] MARCH, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE CLIMATE OF ASSAB.*

The first thing requisite is to state where Assab is. It is a very small place, on a bay of the same name, in the east of Abyssinia, at the southern extremity of the Red Sea, opposite to Mocha and just north of the Straits of Bab-el-Mandeb.

The pamphlet before us is a reprint of a popular article written by Prof. Ragona for the daily journal, *Il Panaro*, and is based upon the observations made daily at 9 a.m., 3 p.m., and 9 p.m. at Assab in 1882 and printed in extenso in Vol. IV. part II. of the Italian *Annali dell' Ufficio centrale di Meteorologia.*

Neither in the *Annali* nor in Prof. Ragona's pamphlet is anything said as to the position of the instruments, but the publication by Sig. Tacchini of the observations implies that it was reasonably good.

The immediate vicinity of Assab has long been considered the hottest region in the world. Massowah which is on the same coast of the Red Sea, but about 300 miles further N.W.† is described by Hann as remarkable for its extraordinary and constant heat. Prof. Rohlfs asserts (but the following table seems to show that his records were too high) that the spring water from depths of 12 ft. to 15 ft., was from 93° to 95°, while the air temperature had reached 129° or even 134°.

We cannot accept the mean temperature (87·1) given by Prof. Ragona since it is $\frac{9+3+9}{3}$ which is obviously a little too high. In the absence of observations at 3 a.m., it is far better to ignore the 3 p.m. readings and take $\frac{9+9}{2}$.

* *Sul Clima di Assab*, by Prof. Domenico Ragona. Modena, Moneti e Namias, 1885.

† By the bye it is in the same latitude as Khartoum; Massowah and Khartoum being at the W. and E. extremities of the base of an equilateral triangle of which Suakim is the Northern apex.



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Unfortunately the minimum thermometer was not recorded after May 6th, consequently its readings cannot be utilized.

However, there still exist data of considerable importance, and we here give the results converted into Fahrenheit degrees; and alongside we give the figures for Aden (which is about 100 miles further East) from Mr. Blanford's *Report on the Meteorology of India*, for 1882.

*Shade Temperature at Assab and at Aden, in* 1882.

| | Assab. | | | | | | Aden. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean. | Absolute. | | | Mean. | | Absolute. | |
| | 9 a.m. | 3 p.m. | 9 p.m. | 9 & 9. | Max. | min. | 8 a.m. | 4 p.m. | M. & m. | Max. | min. |
| | deg. | deg. | deg. | deg. | deg. | deg. | deg. | deg. | deg. | deg. | deg. |
| Jan..... | 79·7 | 82·0 | 79·0 | 79·3 | 83·7 | 70·0 | 77·5 | 78·7 | 77·5 | 84·5 | 68·9 |
| Feb..... | 80·1 | 81·7 | 79·5 | 79·8 | 84·2 | 70·3 | 77·9 | 78·9 | 78·0 | 86·8 | 71·4 |
| March... | 81·9 | 84·6 | 80·8 | 81·4 | 88·7 | 72·5 | 79·1 | 80·6 | 79·6 | 89·3 | 71·1 |
| April ... | 86·7 | 89·8 | 84·2 | 85·4 | 95·9 | 74·5 | 83·8 | 86·3 | 83·8 | 97·9 | 72·9 |
| May..... | 90·5 | 92·5 | 87·3 | 88·9 | 101·8 | 77·9 | 88·6 | 90·3 | 88·2 | 100·8 | 74·4 |
| June ... | 93·4 | 95·2 | 89·8 | 91·6 | 100·8 | — | 89·3 | 90·3 | 88·4 | 97·3 | 80·6 |
| July..... | 95·0 | 96·1 | 90·9 | 93·0 | 107·2 | — | 84·9 | 88·3 | 85·5 | 97·9 | 71·9 |
| Aug. ... | 95·5 | 95·5 | 91·2 | 93·3 | 104·4 | — | 86·5 | 87·9 | 86·1 | 97·3 | 72·9 |
| Sept. ... | 93·2 | 94·8 | 90·7 | 92·0 | 98·6 | — | 88·6 | 89·6 | 88·0 | 98·3 | 79·8 |
| Oct..... | 88·9 | 91·0 | 86·5 | 87·7 | 95·0 | — | 86·1 | 85·6 | 84·4 | 96·3 | 72·7 |
| Nov. ... | 83·5 | 85·5 | 81·1 | 82·3 | 87·8 | — | 80·2 | 81·7 | 79·0 | 89·8 | 68·9 |
| Dec. ... | 81·0 | 82·9 | 79·3 | 80·2 | 87·4 | — | 77·6 | 78·0 | 77·1 | 86·3 | 67·1 |
| Year..... | 87·4 | 89·2 | 85·1 | 86·2 | 94·6 | — | 83·3 | 84·7 | 82·9 | 93·5 | 72·7 |

Assab is, therefore, hotter by about 3° than even Aden, but this is compensated by the air being dry (mean relative humidity about 52 at Assab, against about 70 at Aden) and this prevents these high temperatures being insupportable; but the nights at Assab are evidently very hot, four consecutive months with 9 p.m. temperatures averaging over 90°, and rarely below 88°, is very serious. At the same time, it must be remembered that the day Maxima, both at Aden and at Assab, are far below what occur in South Australia; for instance, at Adelaide, the first of Mr. Todd's volumes that we take up, gives Maxima in three months of 1879 of 110°·7, 106°·9, and 103°·4 respectively.

## WHIRLWIND IN THE COUNTY KILDARE.

About 11.32 a.m. on Monday, February 2nd, 1885, a whirlwind struck the south end of Sherlockstown House, stripping off the slates, and whirling them in the air like so many sheets of paper. The south end of the roof was wrecked. Some of the slates, which were of unusual size (3 ft. 4 in. by 2 ft. 6 in.) and very heavy, were carried more than 120 feet, striking and making holes in other parts of the roof. The Rev. W. Sherlock, who was in the garden at the time, heard the sudden roar of the wind, and saw the slates ripped from the roof in a moment. The whirlwind appears to have been perfectly local, and, after touching the house, did no further damage than to twist off part of the head of an old Scotch fir tree, standing about 200 yards to the north-east.

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## RAINFALL OF CAPE COLONY.

WE take the earliest opportunity of noticing a very important communication received from Mr. J. G. Gamble, M.Inst.C.E., who has for some years been residing in South Africa, and whose presence as a member of the Cape of Good Hope Meteorological Commission must have materially strengthened that body.

The communication consists merely of seven sheets of lithographs and as they are of foolscap folio size we hope that they are intended, to appear as part of the next report of the commission.

They contain diagrams epitomizing all the best rainfall registers in the Colony; they give for each of 33 stations the average monthly fall, based on the whole of the years observed, which varies from a minimum of five to a maximum of forty-two years. The average period is thirteen years, and 15 of the stations have been in operation for that period or upwards.

The seasonal distribution is entirely opposite in different parts. Near Cape Town the stations show heavy winter rains (May to August), *e.g.*, at Wynberg and Bishop's Court the average for each of those months is about eight inches and for the four summer months (Dec. to March), about one inch. On the other hand, in the extreme east of the Colony, near its frontiers to Basuto Land and Kaffraria, we have at Queenstown and at Aliwal North averages of less than an inch in winter, and of three to five inches in summer.

As regards total fall, the short (five years) average for Pella (Bushmanland) Lat. 29°4′, S., Lon. 19°12′, E. is remarkable. In no month does the average reach half an inch. No rain has ever fallen in November, and the yearly total must be about two inches and a half. On referring to the reports of the Commission, we find the actual values for Pella to be—

| Year..... | 1878 | 1879 | 1880 | 1881 | 1882 | Average. |
|---|---|---|---|---|---|---|
| Total Rainfall... | 1·55 in. | 3·92 in. | 1·42 in. | 3·29 in. | 2·66 in. | 2·57 in. |

On the contrary, at the first mentioned stations Wynberg and Bishop's Court, which are both near Cape Town, the average totals are about 43 and 54 inches respectively.

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## DISTRIBUTION OF RAIN IN MAURITIUS DURING THE DECADE, 1871–80.

By Prof. V. RAULIN, of Bordeaux.

MAURITIUS is approximately semi-circular in shape, its longer axis lying S.S.W.-N.N.E., and its centre in latitude 20° 15′ S. Like Réunion (or Bourbon), it is a volcanic island, but without any crater in activity; there is a tolerably marked mountainous plateau, but none of the peaks are high, the principal being Piton du Milieu, 1931 feet, and the Piton of the Black River Mountains in the S.W., which reaches 2911 feet.

Dr. C. Meldrum, F.R.S., Director of the Royal Alfred Observatory,

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publishes annually the *Results of the Meteorological Observations* made in the Colony, and has been kind enough to furnish me with copies.

Observations during the above decade have been made at sixty stations, but there are only 28 available for the determination of seasonal rainfall; twenty-two extending over from 8 to 10 years, and six from 4 to 7 years.

The *yearly totals* generally range from 80 to 100 inches. The amount is less at three eastern stations, where it falls to 60·48 in., and still less at six stations in the N.W., where it falls as low as 45·55 in. The rain is much heavier in the centre of the Island, and six stations in a line from N. to S. have falls ranging from 128·19 in. to 165·95 in.

The *seasonal distribution* is much more uniform than in Southern India, or at the Cape of Good Hope.

*Régime VII.* (Winter and summer wet) prevails almost everywhere.

*Régime V.* (Winter and autumn wet, spring and summer rather dry) is found only at five stations on the south coast.

## RAINFALL IN MAURITIUS.

| Stations. | Height | Years. | Summ'r. | Aut'mn. | Winter. | Spring. | Year. |
|---|---|---|---|---|---|---|---|
| RÉGIME VII. *Winter and Summer wet.* (A) East and South Coast. | ft. | | in. | in. | in. | in. | in. |
| 1. Labourdonnais | 280 | 1871–80 (10) | 28·59 | 23·94 | 10·59 | 6·89 | 70·01 |
| 2. Rigny | 300? | 1873–80 (8) | 36·10 | 32·30 | 17·59 | 12·64 | 98·63 |
| 3. Riche Mare | 160 | 1871–80 (10) | 22·40 | 20·49 | 11·62 | 6·75 | 61·26 |
| 4. La Gaieté | 120? | 1871–79 (8) | 32·43 | 27·50 | 14·28 | 9·09 | 83·30 |
| 5. Midlands | 1420 | 1873–80 (8) | 49·78 | 49·44 | 32·61 | 20·43 | 152·26 |
| 6. Cluny | 1000 | 1871–80 (9) | 52·54 | 46·72 | 31·25 | 17·03 | 147·56 |
| 7. Joli Bois | 550 | 1871–80 (10) | 41·10 | 40·96 | 25·25 | 15·23 | 122·54 |
| 8. Colmar | 700 | 1871–80 (9½) | 33·70 | 32·10 | 17·64 | 12·03 | 95·47 |
| 9. L'Union | 80 | 1871–80 (10) | 28·45 | 25·81 | 14·93 | 10·44 | 79·63 |
| (B) West Coast and Inland. | | | | | | | |
| 10. Botanical Gardens | 215 | 1871–80 (10) | 25·32 | 20·17 | 8·47 | 5·81 | 59·77 |
| 11. St. André | 184 | 1872–80 (9) | 18·48 | 17·10 | 5·92 | 4·05 | 45·55 |
| 12. Royal Alfred Observatory | 179 | 1871–80 (10) | 22·18 | 18·45 | 6·36 | 5·06 | 52·05 |
| 13. Hermitage | ? | 1871–75 (5) | 49·26 | 40·33 | 28·42 | 15·66 | 133·67 |
| 14. Bonne Veine | 1400 | 1871–80 (10) | 41·64 | 34·11 | 20·18 | 13·46 | 109·39 |
| 15. Alma | 1380 | 1871–80 (9½) | 50·37 | 39·42 | 23·68 | 14·72 | 128·19 |
| 16. Espérance | 1420 | 1871–80 (10) | 50·66 | 41·51 | 23·65 | 14·60 | 130·42 |
| 17. Gentilly | 1200 | 1871–80 (9½) | 34·88 | 23·71 | 11·69 | 7·68 | 77·96 |
| 18. Lynnwood | 1080 | 1876–80 (5) | 29·39 | 19·66 | 9·38 | 5·21 | 63·64 |
| 19. Curepipe | 1700 | 1871–77 (4½) | 60·31 | 52·77 | 35·95 | 16·92 | 165·95 |
| 20. Westra | 1300 | 1871–80 (10) | 30·13 | 25·27 | 14·64 | 7·70 | 77·74 |
| 21. Beau Séjour | 970 | 1871–80 (10) | 30·39 | 23·62 | 8·45 | 5·70 | 68·16 |
| 22. Trianon | 1000 | 1871–80 (9½) | 28·56 | 22·37 | 9·43 | 5·95 | 66·31 |
| 23. Dry-Burn* | ? | 1873–78 (5½) | 31·23 | 24·72 | 11·24 | 7·11 | 74·30 |
| RÉGIME V. *Winter and Autumn wet, Spring and Summer rather dry.* | | | | | | | |
| 24. Beau Vallon | 240 | 1871–80 (10) | 21·32 | 21·83 | 10·28 | 7·05 | 60·48 |
| 25. Gros Bois | 500 | 1871–80 (10) | 32·40 | 34·30 | 18·92 | 13·42 | 99·04 |
| 26. Fontenelle | 250 | 1875–80 (6) | 26·76 | 26·87 | 15·74 | 11·92 | 81·29 |
| 27. St. Aubin | 300? | 1871–80 (10) | 28·49 | 29·15 | 15·08 | 14·18 | 83·90 |
| 28. Highlands* | ? | 1874–79 (6½) | 29·41 | 30·36 | 14·00 | 8·48 | 82·25 |

* The position of these stations being unknown, they are omitted from the map.

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## ROYAL METEOROLOGICAL SOCIETY.

THE usual Monthly Meeting of this Society was held on Wednesday evening, February 18th, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. H. B. Baker, M.D., S. Dixon, R. Foster, and B. O. Meek, F.L.S., were elected Fellows of the Society. The following papers were read :—

1. "How to detect the anomalies in the annual range of temperature," by Dr. Buys Ballot, Hon. Mem. R.Met.Soc. The author shows that it is most likely that only a long continued series of observations can give evidence of an interruption of rise and fall, especially in localities where the temperature of the same day in different years may differ by 20° C. (36° F.) as at St. Petersburg.

2. "Cloud Observing," by D. W. Barker, F.R.Met.Soc. As there is a great deal of confusion amongst cloud observers, not only as to the particular names of clouds, but more especially with regard to their movements, the author recommends that there should be two simple divisions, viz., "stratiform" and "cumuliform." To the stratiform belong all the higher forms of cloud and a few of the lower; to the latter belong the typical cumulus cloud always seen in the lower atmosphere. From the result of numerous observations, the author's conclusion is that the actual normal motion of the cirro-filum cloud is along the line of filature, and that knowing the bearing of the V or radiating point, the direction of its motion can be at once inferred. In all cases the author observed the V point first formed in the point from which the cloud is coming, but it will frequently be noticed that threads first appear parallel to a certain point on the horizon, and in all sorts of positions between this and the central V point.

3. "A suggestion for the improvement of radiation thermometers," by W. F. Stanley, F.R.Met.Soc. The author suggests that the radiation thermometer should indicate the amount of heat radiated by the sun upon a metal ball of a certain size, this being an object easy of uniform reproduction by mechanical means. For experiment, he made three hollow copper balls, which were cast with ordinary filed cores, and were of different weights. These balls were turned to exact external diameter of 1·4 in., with similar necks for the insertion of thermometers. The surfaces were oxidised by heating, to resemble the oxidation produced by the atmosphere. Into each of these balls a similar thermometer was inserted, and the neck closed round just sufficiently to keep it steady by cotton thread soaked in paraffin. The three thermometers thus enclosed in the metal balls, when exposed to sunshine and placed at 2 ins. above a piece of black board, appeared to register, under similar conditions, exactly alike. The experiments for three summer months gave from 6° to 11° difference between these instruments in the sun, and the shade temperature.

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## THE NEW TIME.

*To the Editor of the Meteorological Magazine.*

SIR,—Having read with interest your article in the January Magazine on the proposed alteration in the method of reckoning time, I trust you will give me leave to state some reasons why it appears to me that the argument on this matter is not all on one side.

In the first place, I would take exception to the assumed fact that the conference at Washington recommended such a change as you advocate. As far as I can gather, the recommendations of the conference were mainly these three, namely—

1. The universal adoption of the meridian of Greenwich as the zero of longitude.

2. The assimilation of the astronomical day to the civil day, by commencing it at midnight instead of at noon.

3. The adoption "for all purposes for which it may be found convenient" of a "universal day," which should be the Greenwich day, and the hours of which should be counted, as those of the astronomical day are at present, from 0 to 24.

I am open to information upon the point, but I have not as yet seen any report of the proceedings of the conference which would lead me to suppose that that body contemplated an interference with social usages in the matter of reckoning time; and there is, I think, some evidence to the contrary. The only reference that I find to the method of counting the hours from 0 to 24 applies to the "universal day." It would be too absurd to suppose that this "universal day" was intended to supersede the local day for civil purposes throughout the world. No one would suppose it likely or possible that the inhabitants of India or of America (for example) would be content to adopt for the ordinary purposes of life a day having no reference to their own hours of light and darkness, of noon and midnight. Moreover, the resolution of the conference provides that the "universal day" "shall not interfere with the use of local or other standard time when desirable;" and as no change was suggested (so far as appears) in the method of counting the hours of the local day, it seems to follow that the innovation now proposed cannot fairly claim the sanction of the Washington conference, and must therefore be discussed simply upon its own merits.

What then are the advantages, and what are the disadvantages, to be expected from the change?

The only definite advantage that I can find in the method of counting the hours of the local day from 0 to 24, is that persons undertaking very long journeys (perhaps, at any given time, one in ten thousand of the population) would be saved a certain small amount of trouble in settling their trains.

Against this advantage I would place two very palpable disadvantages affecting the whole community.

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First, the reading of clocks and watches would be rendered greatly more difficult than at present.

Secondly, clocks striking the hours—whether public or domestic clocks—would become so intolerable a nuisance that they would of necessity be abolished.

To my mind, the division of the day of 24 hours into two periods of 12 hours each is a natural and happy device for meeting a serious inconvenience.

One word as to the "universal day." Whether the adoption of such a day would be advantageous in astronomy and in navigation is a question which may be left to be answered by the persons most interested in those pursuits. In meteorology, there may be special inquiries for which simultaneous observations are desirable, but these may be easily secured without a "universal day;" while, with regard to investigations of temperature, it is clear that observations taken at hours having no reference to the local day, would be valueless for purposes of comparison between one place and another. Even in telegraphy, the utility of the "universal day" would, I think, be quite doubtful. True, we have at present the anomaly of messages from the East arriving (so to speak) before they are sent, but I am not aware that there is any real inconvenience in this; and if the paradox should occasionally puzzle the ignorant, so much the better. Such persons will be set thinking and inquiring about the explanation, and knowledge will be increased.

GEORGE F. BURDER.

*Clifton, 27th February*, 1885.

[We think that Dr. Burder may rest assured that the New Time is dead and buried. We are very sorry, as in spite of the objections raised to it, all which we have carefully considered, we still hold it to be preferable to the double nomenclature. In justice to ourselves, we desire to mention that we should not have adopted either of the courses suggested by Dr. Burder. We should not have approved of altering the angular motion of clock or watch hands, but have allowed the hour hand to make two revolutions per diem as it does now, merely adding an extra ring of figures—13 to 24. Nor should we have advised any such wild scheme as letting a town clock strike 24 strokes. Any one accustomed to the Cambridge chimes of Big Ben will at once see that 13 strokes would be ample, and we should prefer a maximum of 7; variations in tone or interval would soon be learned and far less liable to error than the present plan of counting up to 12.

However, as we have already stated, we believe the scheme to be dead—strangled with red tape, and buried by the astronomers under imaginary difficulties in the use of the Nautical Almanac. But people object to getting out of ruts, and it is so reasonable and so scientific to write 9 a.m. when we mean 3 a.m.—(Put it in English, and the absurdity becomes evident, 9 a.m. = 9 hours before noon, but we mean 3 hours before noon)—that, of course, it would be a pity to give it up.

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It is, however, only on a par with the remarkable periods which we call months. There are 12 of them, and there are 365 days to be appropriated to them. One would think that the obvious plan would be to take 30 as the minimum, and add 1 to nearly each alternate month. But what do we do? We give February only 28, and then having 7 to add on, we do so in such irregular order that somebody had to compose a doggrel *mem. tech.* in order to ensure their being added to the right ones. The final result is, that the early months of the year begin about $1\frac{3}{4}$ days too soon, and that instead of having months differing in length by only about 3 per cent., we have between February and its precursor and follower differences of more than 10 per cent. The muddle that this produces in much statistical work can readibly be imagined, and yet we aresure that short "February" will survive for generations happy in the company of our enemies, A.M. and P.M.—ED.]

## ON THE FORMATION OF MACKEREL SKY.

BY DR. H. MUIRHEAD.

[Abstract of paper read before the British Association at Montreal].

AT the Glasgow meeting of the Association in 1876, Sir William Thomson read a short note on the formation of mackerel sky.* The author having paid much attention to the various aspects of the congeries of cloudlets so named, has come to the conclusion that the following is the usual mode in which they are generated. Given a thinnish stratum of moist air in process of passing over a drier and cooler body of air, of different velocity or direction. The vapour by cooling will become visible, and from friction the stratum will get rolled into long cylinders. Now let another current of air brush across the cylinders at right angles to their length, or indeed any large angle. This will have the effect of rolling the thinnish stratum into cylinders crossing the first set. And now neither set will appear as long continuous rollers, but from being crossed will show as a congeries of little cloudlets or drums, *i.e.*, mackerel sky.

In favour of this hypothesis it may be noted that if attention be paid to the cloudlets there will often be observed, at one or other extremity of the formation, portions of the cylinders which extend continuously for a considerable length where they have not been divided into drums by a crossing current. Again, if one of the currents moves too rapidly, some of the cloudlets will get so torn by it that they will often show as wisps or mare's tails. Moreover, it may sometimes be observed that when a long slender cloud is sailing end-long across the sky, that a portion of its length gets segmented crosswise so as to show somewhat like the rattles of a snake.

Assuming that the foregoing is the usual mode of formation of this sky from a thinnish vapour-laden stratum, if the wedge does not push inwards in increased volume, the visible vapour will gradually

* See *Met. Mag.*, Vol. XI. (1876), p. 131.

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disappear, diffused in the neighbouring drier air, and fair weather probably may follow. If, however, it drive in in largely increased volume, the cloudlets will be lost in the formation of large continuous cloud—a likely harbinger of rain, as we know is often the case in such circumstances.

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## DRY DATES IN 1884.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. J. W. Scott having called attention to the "dry dates" in 1884 in his locality, it may not be uninteresting to mention that I notice a similar coincidence:—16th December ·14 is the only entry for that day; and only two for 17th, May, ·05, and July, ·10. The 6th of the month has been the wettest day, and it was on this day that the heaviest fall of the year occurred. The sum total of the falls on this day is also the largest in the year, but the 5th runs it very close.

Yours truly,

G. H. M. WHISH.

*28, Addison Gardens, Kensington, W. February 21, 1885.*

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SIR,—Your correspondent, Mr. J. W. Scott, will perhaps be interested to learn that at Nottingham also there was an absence of rain on the 16th and 17th of the months in 1884, as shewn in the following table:—

| | 16th. | | 17th. | | 16th. | | 17th. |
|---|---|---|---|---|---|---|---|
| January ... | — | ..... | ·001 | July ..... | — | ..... | ·022 |
| February.. | — | ..... | — | August..... | — | ..... | — |
| March..... | — | ... .. | ·022 | September. | — | ..... | — |
| April ..... | ·027 | ... .. | — | October ... | — | ..... | — |
| May..... | — | ..... | — | November.. | — | ..... | ·008 |
| June ..... | ·019 | ..... | — | December.. | ·230 | ..... | ·066 |

I also notice that the rainfall observations here for the last 45 years shew that every tenth year has been a dry one, as will be seen from the following table:—

| Year. | | Rainfall at Nottingham. | | Relation to mean of 45 years. |
|---|---|---|---|---|
| 1844 | ..... | 20·900 | ..... | —5·172 |
| 1854 | ..... | 17·400 | ..... | —8·672 |
| 1864 | ..... | 17·400 | ..... | —8·672 |
| 1874 | ..... | 18·136 | ..... | —7·936 |
| 1884 | ..... | 20·100 | ..... | —5·972 |

I am, yours truly,

FRANK RAYNER, Stud. Inst. C.E.

*Nottingham, 12th March, 1885.*

[With reference to the dryness of years ending with 4, see *Brit. Rain.*, 1882, p. 18.—ED.]

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## SCRAPS.

ARTIFICIAL BALL LIGHTNING.—An effect which bears a strong resemblance to ball lightning has been produced by M. Planté with the help of a battery of 16,000 Planté couples, giving an electromotive force of about 40,000 volts on first discharging. He prepared two pads of filter paper moistened with distilled water, and brought them very near together, with, however, a layer of air between, the whole forming an air condenser. The pads were connected to the poles of his battery or accumulators, and he then observed a small globule of fire or mimic lightning moving about between the pads, and sometimes passing from one pad to the other. When a pad became dry at any point the light appeared at some other point, but would reappear at the old place when it was moist again. The likeness to fire balls is very striking; their peculiar wandering character is imitated; and if we suppose the pads of the air condenser to represent the wet earth and a charged cloud, the analogy becomes still more remarkable. If we are not mistaken the late C. F. Varley suggested that ball lightning might be the luminous end of a discharge travelling about on the surface of the earth, and M. Planté's experiment tends to support this view.—*Engineering.*

[Mr. Varley exhibited the phenomenon, December 11th, 1872. See *Jour. Soc. Tel. Engineers*, vol. 1, p. 368.—ED.]

MANUFACTURING RAIN.—The ingenious plan for rain-making proposed by General Ruggles, of Virginia, is in accordance with a theory of rain-formation long held by eminent savans.—[? ED.] The plan is to send up into the moist strata of the atmosphere dynamite cartridges, lodged in balloons, to be exploded by time fuses, or electric wires connected with the earth. The explosion, it is claimed, will have the effect of bringing together masses of air of different temperatures and humidities, causing condensation of the vapour aloft sufficient to produce rain.

[Much has been written on this subject—for instance we remember a pamphlet with the title Cannons and Tempests. It *might* be worth while to collect the literature and examine it.—ED.]

FROZEN GROUND.—A well sunk at Yakoutsk, in Siberia, to the depth of 540ft. disclosed the fact that the ground was permanently frozen to this depth, and probably to the depth of 700 ft. The rate of increase of temperature was 1° in 52 ft.

[We cannot quite follow the argument here. The writer seems to have much understated the total depth frozen if he is correct in taking the increase at 1° in 52 ft. Jakutsk (or Yakoutsk) is probably the coldest large town in the world, and yet sometimes it is hotter there than it ever is at Barbados. Jakutsk is on the Lena in N. lat. 62° 1′, E. lon. 129° 42′ and about 500 feet above sea level. The average temperature of January is —44° F. (76° below freezing) and the average temperature for the whole year is 13°·3 F., or 18°·7 below freezing. On individual occasions the temperature has risen to 101°·8, and it once fell to —79°·6, or 111°·6 below freezing—being far below that usual to Arctic explorers. We, however, have to consider only the mean annual temperature, 13°·3; as this is 18°·7 below freezing, it is evident that if the increase is 1° for 52 ft., unfrozen ground can only occur at the depth of 972 ft., and this seems to us a more probable depth than 700 ft. The extreme heat in summer will, of course, penetrate to some little depth, but probably not more than 40 or 50 ft.—ED.]

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1884.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 86·9 | 4 | 42·2 | 26 | 74·1 | 54·4 | 55·2 | 75 | 125·0 | 35·7 | 2·46 | 17 | 6·3 |
| Malta | 94·6 | 19 | 63·2 | 5 | 83·8 | 68·8 | 65·4 | 70 | 142·6 | ... | ·00 | 0 | 0·5 |
| *Mauritius* | 78·0 | 4 | 58·0 | 20 | 75·2 | 63·4 | 60·0 | 74 | 124·7 | 46·9 | 1·55 | 12 | 4·2 |
| Calcutta | 93·0 | 15 | 75·6 | 21 | 87·6 | 78·5 | 78·3 | 87 | 160·2 | 70·7 | 11·96 | 24 | 8·2 |
| Bombay | 88·3 | 5 | 74·0 | 26 | 84·4 | 77·0 | 77·2 | 88 | 138·6 | 71·4 | 25·87 | 28 | 9·4 |
| Ceylon, Colombo | 86·2 | 12* | 75·0 | 7 | 85·2 | 78·2 | 73·2 | 76 | 140·5 | 65·8 | 2·11 | 11 | 6·3 |
| *Melbourne* | 64·9 | 9 | 29·9 | 24 | 55·1 | 39·4 | 40·2 | 79 | 109·0 | 24·5 | ·78 | 7 | 6·1 |
| *Adelaide* | 64·8 | 7 | 35·2 | 23 | 57·2 | 41·9 | 40·3 | 70 | 124·4 | 26·5 | ·51 | 6 | 5·1 |
| *Wellington* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Auckland* | 60·0 | 9 | 38·0 | 23 | 56·5 | 46·8 | 44·1 | 76 | 117·0 | 27·0 | 2·78 | 27 | 5·8 |
| Jamaica, Kingston | 91·6 | 17 | 72·2 | 29 | 88·8 | 74·1 | 71·8 | 73 | ... | ... | ·69 | ... | 5·2 |
| Barbados | 84·0 | 24 | 70·0 | 26 | 83·0 | 73·0 | 75·3 | 84 | 144·0 | ... | 4·21 | 13 | 5·0 |
| Toronto | 85·6 | 1 | 45·1 | 15 | 73·7 | 54·3 | 54·6 | 71 | 142·0 | 38·5 | 2·12 | 15 | 5·8 |
| New Brunswick, Fredericton | 91·0 | 1 | 40·1 | 27 | 72·8 | 52·9 | 55·4 | 80 | ... | ... | 7·83 | 17 | 7·3 |
| Manitoba, Winnipeg | 79·2 | 24 | 37·7 | 3 | 69·5 | 49·6 | 53·8 | 76 | ... | ... | 1·32 | 12 | 6·1 |
| British Columbia, Victoria | 72·0 | 20 | 43·0 | 9 | ... | ... | ... | ... | ... | ... | ·48 | 5 | ... |

* And 14.

### REMARKS, JULY, 1884.

MALTA.—Mean temp. 75°·5; mean hourly velocity of wind 8·1 miles; sea temp. rose from 74° to 83°, and then fell to 77°. The glow after sunset continued.

J. SCOLES.

*Mauritius.*—Rainfall 1·07 in., and mean temp. 0°·2 below average; mean hourly velocity of wind 2·4 miles below the average, prevailing direction S.E. Unusual colorations of sky before sunrise and after sunset daily, lasting 1 hr. 12 min.

C. MELDRUM, F.R.S.

*Melbourne.*—Mean temp. of air 1°·1, and of dew point 1°·2 below average. Rainfall 1 inch, and humidity and amount of cloud slightly below average; pressure slightly above the average. Prevailing wind N., strong on 5 days; heavy dew on 9 days; hoar frost on 9 days; ice on 4 days; fog on 7 days. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Pressure above 30 in. throughout the month, which has only once occurred previously (in June, 1877), the mean being ·166 in. above the average; mean temp. the lowest, and total rainfall the smallest on record for July. The weather was remarkably fine, and the mean amount of cloud 13 per cent. below average.

C. TODD.

*Auckland.*—Weather showery throughout, and remarkable for the predominance of S.W. and W. winds; total rainfall small, fully 2 inches below average; pressure above and mean temp. below average. T. F. CHEESEMAN.

JAMAICA.—The rainfall for July was much below the average, and drought was severely felt in several places. Prevailing wind S.E. by E., mean hourly velocity 4·3 miles. MAXWELL HALL.

BARBADOS.—Pressure very unsteady and slightly below the average; mean temp. (77°) 0°·3 above average; prevailing wind N.E., mean hourly velocity 12·4 miles, extremes 18·5 miles and 7·7 miles. Rainfall 47 per cent. below average. Seven days were overcast. R. BOWIE WALCOTT.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1884.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 92·0 | 11 | 45·7 | 26 | 77·1 | 54·5 | 52·2 | 66 | 125·4 | 38·7 | ·89 | 10 | 3·6 |
| Malta | 91·3 | 6 | 64·3 | 1 | 85·2 | 70·6 | 67·4 | 73 | 149·0 | ... | ·00 | 0 | 1·0 |
| *Mauritius* | 78·4 | 12 | 54·1 | 22 | 74·8 | 62·1 | 57·3 | 70 | 126·4 | 46·9 | ·34 | 8 | 5·0 |
| Calcutta | 90·5 | 2 | 75·5 | 31 | 87·3 | 78·2 | 78·1 | 87 | 163·6 | 71·6 | 10·97 | 25 | 7·9 |
| Bombay | 86·7 | 8 | 75·0 | 11 | 84·6 | 76·8 | 76·7 | 87 | 143·2 | 72·5 | 15·29 | 28 | 7·6 |
| Ceylon, Colombo | 86·0 | 31 | 73·3 | 30 | 84·1 | 77·5 | 72·9 | 77 | 141·5 | 59·5 | 1·19 | 9 | 6·9 |
| *Melbourne* | 73·0 | 30 | 33·0 | 1 | 61·5 | 45·4 | 42·1 | 69 | 120·7 | 26·2 | 1·63 | 13 | 6·4 |
| *Adelaide* | 81·1 | 30 | 40·9 | 20 | 64·0 | 48·1 | 42·5 | 63 | 133·4 | 33·5 | 1·09 | 16 | 5·9 |
| *Wellington* | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *Auckland* | 64·0 | 28 | 40·0 | 5 | 57·9 | 48·8 | 45·6 | 75 | 122·0 | 29·0 | 5·69 | 27 | 7·0 |
| Jamaica | 91·1 | 11*a* | 70·8 | 8 | 88·4 | 73·5 | 72·6 | 78 | ... | ... | 4·79 | ... | 6·4 |
| Barbados | 84·0 | 23 | 70·0 | 16 | 82·0 | 72·0 | 75·5 | 86 | 144·0 | ... | 7·35 | 15 | 6·0 |
| Toronto | 89·6 | 19 | 44·1 | 27 | 75·8 | 54·7 | 56·6 | 72 | 148·0 | 37·0 | 2·12 | 12 | 4·2 |
| New Brunswick, Fredericton | 85·7 | 20*b* | 40·5 | 28 | 77·0 | 55·3 | 58·8 | 80 | ... | ... | 4·23 | 14 | 5·7 |
| Manitoba, Winnipeg | 88·1 | 13 | 36·0 | 23 | 71.8 | 50·6 | 56·4 | 79 | ... | ... | 6·90 | 15 | 6·7 |
| British Columbia, Victoria | 86·0 | 2 | 43·0 | 15 | ... | ... | ... | ... | ... | ... | 1·84 | 8 | ... |

*a* And 18. *b* And 21.

### Remarks, August, 1884.

Malta.—Mean temp. 77°·1; mean hourly velocity of wind 7·5 miles; sea temp. rose from 79° to 82°. L on 27th. J. Scoles.

*Mauritius.*—Rainfall 1·35 in., mean temp. 0°·9, and mean hourly velocity of wind 1·8 miles below their respective averages. Prevailing wind S.E. by S. to E.S.E. Prolonged colourations of the sky before sunrise, and after sunset, but not intense. C. Meldrum, F.R.S.

Calcutta.—Rainfall very deficient, especially in the central districts of Bengal, and in a large portion of Behar. J. Eliot.

*Melbourne.*—Mean temp. 2°·4 above average; temp. of dew point average; humidity, pressure and rainfall all about the average. Prevailing wind N., strong on 12 days, heavy dew on 3 days, ice on 1 day, L on 3 days. R. L. J. Ellery, F.R.S.

*Adelaide.*—The month was very dry, the rainfall being less than half the average; the weather, as a whole, was fine, but cloudy. During the last few days, pressure fluctuated considerably, and gales occurred on 26th and 30th; mean temp. (56°·0), 2° above the average, the max. being the highest in August since 1862. C. Todd.

*Auckland.*—From 1st to 9th, showery and equally with S.W. winds; heavy R on 13th and 16th; from 18th to end of month S.W. winds and frequent showers. Mean temp. above average, rainfall 1·19 in. above average. T. F. Cheeseman.

Kingston.—On 20th, 2·64 in. of R fell between 3.30 and 4.30 p.m.; in the lower part of Kingston H fell. Direction of wind S.E., mean hourly velocity 3 miles. Maxwell Hall.

Barbados.—Mean temp. (76°·2) 1°·4 below average. N.E. winds prevailed on 29 days; average velocity 9·7 miles per hour, extremes 16·2 miles, and 5·5 miles, which is 18 per cent. above the average. Rainfall 6 per cent. below the average. Seven days were overcast. R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·58 | XI. | Rhayader, Nantgwillt.. | 9·15 |
| ,, | Margate, Birchington... | 1·95 | ,, | Carno, Tybrith ... ..... | 6·25 |
| ,, | Littlehampton ..... | 3·59 | ,, | Corwen, Rhug ..... | 4·54 |
| ,, | Hailsham ..... | 4·26 | ,, | Port Madoc ..... | 7·52 |
| ,, | I. of W., St. Lawrence. | 3·34 | ,, | I. of Man, Douglas ..... | 4·16 |
| ,, | Alton, Ashdell..... | 4·14 | XII. | Stoneykirk, Ardwell Ho. | 3·01 |
| III. | Winslow, Addington ... | 2·67 | ,, | Melrose, Abbey Gate... | 3·54 |
| ,, | Oxford, Magdalen Col... | 2·67 | XIII. | N. Esk Res. [Penicuick] | 2·75 |
| ,, | Northampton ..... | 2·92 | XIV. | Ayr, Cassillis House ... | 4·35 |
| ,, | Cambridge, Beech Ho... | 1·45 | ,, | Glasgow, Queen's Park. | 3·60 |
| ,, | Wisbech, Bank House.. | 2·00 | XV. | Islay, Gruinart School.. | 5·85 |
| IV. | Southend ..... | 1·90 | XVI. | St. Andrews, Newton Bk. | 2·86 |
| ,, | Harlow, Sheering ... .. | 2·49 | ,, | Balquhidder, Stronvar.. | 13·56 |
| ,, | Rendlesham Hall ..... | 2·17 | ,, | Dunkeld, Inver Braan.. | 5·66 |
| ,, | Diss ..... | 2·12 | ,, | Dalnaspidal H.R.S. ... | 8·75 |
| ,, | Swaffham ..... | 2·01 | XVII. | Keith H.R.S. ..... ..... | 1·84 |
| V. | Salisbury, Alderbury... | 3·77 | ,, | Forres H.R.S. ..... ... | 2·35 |
| ,, | Warminster ..... | 4·22 | XVIII. | Strome Ferry H.R.S.... | 8·91 |
| ,, | Calne, Compton Bassett | 3·23 | ,, | Lochbroom ..... | 5·73 |
| ,, | Ashburton, Holne Vic.. | 10·11 | ,, | Tain, Springfield..... | 2·42 |
| ,, | Holsworthy, Clawton... | 4·25 | ,, | Loch Shiel, Glenaladale | 13·08 |
| ,, | Hatherleigh, Winsford. | 4·34 | ,, | Invergarry ..... | 10·78 |
| ,, | Lynmouth, Glenthorne. | 5·59 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Probus, Lamellyn ..... | 4·99 | ,, | Forsinard H.R.S. ..... | 2·00 |
| ,, | Wincanton, Stowell Rec. | 3·27 | ,, | Watten H.R.S. ..... | 2·60 |
| ,, | Wells, Westbury..... | 2·69 | XX. | Dunmanway, Coolkelure | 10·65 |
| VI. | Bristol, Clifton ..... .. | 3·35 | ,, | Fermoy, Gas Works ... | 5·22 |
| ,, | Ross ..... | 4·50 | ,, | Tralee, Castlemorris ... | 4·37 |
| ,, | Wem, Sansaw Hall..... | 2·37 | ,, | Tipperary, Henry Street | 5·21 |
| ,, | Cheadle, The Heath Ho. | 2·55 | ,, | Newcastle West ..... | 2·57 |
| ,, | Worcester, Diglis Lock | 2·72 | ,, | Miltown Malbay..... | 3·75 |
| ,, | Coventry, Coundon ..... | 3·25 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 2·35 | XXI. | Carlow, Browne's Hill.. | 3·51 |
| ,, | Ketton Hall [Stamford] | 2·17 | ,, | Navan, Balrath ..... | 2·72 |
| ,, | Horncastle, Bucknall ... | 2·30 | ,, | Mullingar, Belvedere ... | 2·68 |
| ,, | Mansfield, St. John's St. | 3·17 | ,, | Athlone, Twyford ..... | 4·45 |
| VIII. | Macclesfield, The Park. | 2·16 | XXII. | Galway, Queen's Col.... | 3·09 |
| ,, | Walton-on-the-Hill..... | 2·96 | ,, | Clifden, Kylemore ..... | 9·11 |
| ,, | Lancaster, South Road. | 3·88 | ,, | Crossmolina, Enniscoe.. | 5·61 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 2·86 |
| IX. | Wakefield, Stanley Vic. | 2·00 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·64 | ,, | Rockcorry..... | 3·55 |
| ,, | Scarborough..... | 1·54 | ,, | Warrenpoint ..... | 4·79 |
| ,, | East Layton [Darlington] | 1·69 | ,, | Newtownards ..... | 3·22 |
| ,, | Middleton, Mickleton .. | 2·80 | ,, | Belfast, New Barnsley.. | 4·05 |
| X. | Haltwhistle, Unthank.. | 2·32 | ,, | Cushendun ..... | 4·16 |
| ,, | Shap, Copy Hill ..... | 12·89 | ,, | Bushmills ..... ..... | 4·25 |
| XI. | Llanfrechfa Grange ..... | 5·49 | ,, | Stewartstown ..... | 3·39 |
| ,, | Llandovery ..... | 5·86 | ,, | Buncrana ..... | 3·30 |
| ,, | Castle Malgwyn ..... | 7·00 | | | |

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# FEBRUARY, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·86 | + 1·22 | ·76 | 16 | 18 | 57·8 | 12 | 27·6 | 21 | 5 | 11 |
| II. | | Maidstone (Hunton Court)... | 2·70 | + 1·08 | ·43 | 15*a* | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 2·56 | + ·81 | ·41 | 15*a* | 18 | 56·1 | 24 | 23·3 | 20 | 6 | 14 |
| III. | | Hitchin ..... | 2·20 | + ·60 | ·42 | 16 | 19 | 53·0 | 12 | 20·0 | 20 | 11 | ... |
| ,, | | Banbury ..... | 3·12 | + 1·28 | ·54 | 4 | 17 | 55·0 | 24 | 23·5 | 21 | 8 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·98 | + ·21 | ·47 | 16 | 17 | 56·0 | 12 | 20·0 | 20 | 10 | ... |
| ,, | | Norwich (Cossey) ..... | 2·17 | + ·42 | ·44 | 15 | 14 | 57·5 | 12 | 24·5 | 21 | 6 | 9 |
| V. | | Weymouth(LangtonHerring) | 3·93 | ... | ·66 | 26 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 3·94 | + ·75 | ·59 | 1 | 21 | 60·0 | 25 | 28·0 | 21 | ... | ... |
| ,, | | Bodmin ..... | 5·58 | + ·71 | 1·31 | 1 | 21 | 52·0 | 15*c* | 26·0 | 21 | 3 | 9 |
| VI. | | Stroud (Upfield) ..... | 3·85 | + 1·60 | ·64 | 16*b* | 18 | 55·0 | 12 | 25·0 | 20 | 6 | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·73 | + 1·23 | ·55 | 1 | 21 | 55·0 | 24 | 27·0 | 18 | 7 | 9 |
| ,, | | Tenbury (Orleton) ..... | 3·92 | + 1·45 | ·72 | 21 | 17 | 60·5 | 24 | 17·8 | 21 | 8 | 12 |
| VII. | | Leicester ..... | 2·68 | ... | ·71 | 16 | 16 | 58·5 | 24 | 22·0 | 21 | 4 | 17 |
| ,, | | Boston ..... | 1·73 | — ·05 | ·52 | 16 | 11 | 56·0 | 24 | 28·0 | 21 | 6 | ... |
| ,, | | Grimsby (Killingholme)..... | 3·03 | + 1·23 | ·54 | 16 | 21 | 55·0 | 24 | 29·0 | 21 | 4 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 2·02 | ... | ·59 | 16 | 19 | 60·0 | 24 | 22·0 | 21 | 8 | ... |
| VIII. | | Manchester (Ardwick)..... | 2·50 | + ·31 | ·37 | 1 | 20 | 54·0 | 24 | 25·0 | 21 | 6 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·80 | — ·35 | ·80 | 4 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 6·72 | + 2·08 | ·94 | 8 | 22 | 54·0 | 24 | 19·0 | 19 | 7 | ... |
| X. | | North Shields ..... | 1·00 | — ·84 | ·58 | 8 | 13 | 58·0 | 24 | 23·2 | 19 | 12 | 13 |
| ,, | | Borrowdale (Seathwaite)..... | 26·05 | +14·60 | 4·62 | 26 | 21 | 49·2 | 26 | 22·2 | 20 | 3 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 4·19 | + ·53 | ·68 | 26 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 6·10 | + 1·65 | 1·35 | 23 | 19 | 54·0 | 12 | 23·0 | 18 | 6 | 10 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 5·32 | ... | ·58 | 23 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 2·31 | + ·02 | ·50 | 21 | 20 | 57·2 | 24 | 29·2 | 21 | 4 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 5·42 | + 1·61 | ·75 | 2 | 19 | 50·0 | 25*d* | 22·8 | 20 | 7 | ... |
| ,, | | Jedburgh (Sunnyside)..... | 1·94 | + ·18 | ·59 | 8 | 13 | 54·0 | 27 | 18·0 | 20 | 9 | ... |
| XIV. | | Douglas Castle (Newmains) | 6·07 | + 2·90 | ·67 | 2 | 21 | ... | ... | ... | .. | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 7·41 | + 3·02 | 1·61 | 6 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 7·27 | ... | 1·70 | 6 | 23 | 52·0 | 23 | 26·0 | 17 | 6 | ... |
| ,, | | Mull (Quinish) ..... | 8·00 | ... | ·92 | 6 | 23 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 4·30 | + 1·34 | ·80 | 14 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 2·72 | + ·56 | ·56 | 8 | 14 | 51·0 | 12 | 25·0 | 18 | 11 | ... |
| XVII. | | Braemar ..... | 4·26 | + 1·59 | ·70 | 22 | 18 | 48·0 | 12*e* | 12·0 | 20 | 14 | 23 |
| ,, | | Aberdeen ..... | 3·56 | ... | ·98 | 8 | 17 | 54·0 | 24 | 20·0 | 19 | 12 | ... |
| XVIII | | Skye (Sligachan) ..... | 16·44 | ... | 2·81 | 11 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 2·93 | + 1·88 | ... | ... | ... | 55·0 | 26 | 14·0 | 20 | 13 | 26 |
| XIX. | | Dunrobin ..... | 2·05 | ... | ·55 | 13 | 10 | 53·0 | 26 | 22·0 | 20 | 12 | ... |
| ,, | | Orkney (Sandwick)..... | 3·63 | + 1·08 | ·35 | 6 | 25 | 50·8 | 24 | 11·1 | 20 | 9 | 15 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 7·35 | + 2·76 | 1·59 | 21 | 21 | 56·0 | 9 | 25·0 | 17*f* | ... | ... |
| ,, | | Dromore Castle ..... | 5·87 | ... | 1·00 | 23 | 21 | 56·0 | 25 | 30·0 | 19 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 5·82 | ... | ·83 | 21 | 21 | 52·5 | 27 | 22·0 | 19 | 5 | 17 |
| ,, | | Killaloe ..... | 4·70 | ... | ·81 | 6 | 22 | 57·0 | 27 | 24·0 | 19 | 9 | ... |
| XXI. | | Portarlington ..... | 2·35 | + ·14 | ·42 | 6 | 21 | 55·0 | 27 | 26·0 | 19 | 8 | ... |
| ,, | | Dublin (FitzWilliam Square) | 2·81 | + ·65 | ·92 | 16 | 19 | 58·4 | 26 | 26·1 | 19 | 3 | 12 |
| XXII. | | Ballinasloe ..... | 3·20 | + ·69 | ·77 | 21 | 22 | 55·0 | 26 | 22·0 | 16*g* | 14 | ... |
| XXIII | | Waringstown ..... | 4·11 | + 1·86 | ·88 | 21 | 22 | 59·0 | 27 | 20·0 | 18 | 15 | 21 |
| ,, | | Londonderry (Creggan Res.). | 2·81 | ... | ·34 | 26 | 22 | ... | ... | ... | ... | ... | .. |
| ,, | | Omagh (Edenfel) ..... | 4·04 | + 1·76 | ·64 | 6 | 20 | 57·0 | 26 | 22·0 | 18 | 10 | ... |

*a* And 16. *b* And 27. *c* And 24, 25. *d* And 27. *e* And 26. *f* And 18. *g* And 19.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON FEBRUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The month passed without affording facilities for early spring sowing, which seemed probable at first. Autumn-sown crops were checked. No S.

BANBURY.—Mean temp. 42°·3; high wind on 4 days, S on 2, H on 2, L on 2.

CULFORD.—The weather was somewhat unsettled; frequent showers with high winds, and some rather sharp frosts.

LANGTON HERRING.—A wet month; fogs and mists very prevalent. Mean temp. 2°·4 above the average of 13 years. Mean pressure below the average.

BODMIN.—Mean temp. 44°·4.

STROUD.—A wet month, with a few bright warm spring days; T and heavy showers on 27th; S.W. gales on 3 days.

WOOLSTASTON.—A wet month. S on 16th. Strong gale on 21st, with S and sleet. Mean temp. 40°·5.

ORLETON.—A very changeable stormy month, with frequent heavy falls of R, but S only on 16th, when the ground was covered for a few hours. Pressure low throughout the month; mean temp. about 2° above the average. There were many frosty mornings, and a few bright and warm days, but the sky was generally obscured by clouds.

KILLINGHOLME.—A seasonable month; vegetation fairly forward. Springs began to rise, but unless the rains continue, water will be scarce in the summer.

MANCHESTER.—A very unsettled month, but there was comparatively little frost. S fell on 18th, but did not remain long, and on the same date, a sharp clap of T was heard, and vivid flashes of L were seen.

## WALES.

HAVERFORDWEST.—A storm of R with L, accompanied by very low pressure, and remarkably high spring-tides, ushered in February, succeeded by a fortnight of cold, frosty weather; the remainder of the month was wet and stormy, with some very cold days. As a whole the season is early. Precelly range covered with S on 4th; very stormy with L and H on 6th; tremendous gale, lasting two hours, on 8th. Primroses and daffodils in bloom at the close of the month.

LLANDUDNO.—A dull and showery month, but on the whole, mild, the mean temp. being fully 1° above the average. Though the rainfall was little above the average, there were 20 wet days, the average being only 15. The mean daily and the total range of temp. were about the average, and although there were four nights of frost, no damage was done to tender plants.

## SCOTLAND.

CARGEN.—A wet and stormy month; mean temp. 40°·5, slightly above the average; mean pressure unusually low. Sunshine only 60 hours, the average being 90 hours.

JEDBURGH.—The weather was generally pleasant and mild, birds singing freely. Snowdrops in full bloom, and spring flowers generally forward. From 14th to 21st it was cold though dry. High wind, with slight S on the 21st.

OBAN.—A seasonable and stormy month, with R on most days. S on the 18th, 19th and 21st, with very heavy gale on the latter day.

ABERDEEN.—Rainfall about an inch above the average. Prevailing wind S.W., except on the 6th, when it was S.S.E. On the 21st, a violent southerly gale occurred, which continued during the night, and till afternoon of the following day; it was observed that, with one exception, all the public clocks in the town were stopped, the hands pointing between 1.30 and 2 a.m. of Sunday, the 22nd, when the wind attained its maximum force. Hoar frost on 4 days. S on 2.

CULLODEN.—Frost prevailed all through the month, and the temp. was very low. On the nights of the 16th and 18th there was a slight covering of S on the ground. Field labour nsiderably in arrear.

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## IRELAND.

DROMORE.—The month was rather wet, and sometimes stormy, especially about the middle of the month.

WATERFORD.—Rainfall 1·30 in. above the average of ten years. Very high tides on the 1st. Gales on 2nd, 6th and 21st. L on 2nd and 7th. H on 4th and 7th. S on 8th and 16th.

KILLALOE.—Heavy R frequent, especially at night. Mean temp. (41°·6), below the average. Severe gale on 21st.

DUBLIN.—Although the mean temp. closely corresponded with the average, the weather was very changeable, alternate periods of cold and warmth prevailing in alternate weeks. The rainfall and rainy days were both above the average, and pressure considerably below it. Mean temp. 42°·7; mean humidity 83; mean amount of cloud 5·4; prevailing winds S.S.W. and S.W. S, sleet and H on the 17th and 18th; solar halo on 12th, lunar rainbow on 21st; fog on the 15th; gales, or high winds, on several days.

WARINGSTOWN.—A very wet month.

EDENFEL.—A seasonable month. S on the 18th.

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## EUROPE.*

IN the *Meteorological Magazine* for February, 1879, we remarked of the first volume of Stanford's Compendium (Africa):—

"It is really a condensation of nearly all the books of travels ever written, a labour so vast that it may well originally have come from Germany, but it does not read like a translation, nor has it the heaviness which the mass of information contained in it would imply. Reading it is like listening to the personal narrative of an educated man who has himself made all the journeyings "Across the Dark Country" from the fifteenth century to the present time. If the rest of the series are as interesting as is Africa, we consider that a valuable addition will have been made to English literature."

The series is now complete—Africa (1878), Central America, West Indies and South America (1878, and second edition 1882), Australasia (1879, and fourth edition 1884), Asia (1882), North America (1883), and lastly Europe (1885)—and looking through the whole we are glad to say that the high level taken in Africa has been fully maintained in all the subsequent volumes.

It is a strong statement to say that the work has no equal in the English language, but we defy anyone to quote a better description of the world and its inhabitants. And even if we dissect it and take the separate subjects of geography, geology, meteorology, anthropology, fauna and flora, we know of no work with which this series would compare unfavourably.

Take, for instance, the last volume, Europe. What is the best rainfall map of Europe? Krümmel's, of which no English reproduction existed, but it is here facing page 34, and superposed upon it are the latest and best isotherms for January and July, those given by Teisserenc de Bort in the *Annales* of the *Bureau Météor. de France.* Nor is the excellence confined to the maps, though all are good and some of them are very fine (for instance the geological map of Europe is printed in *fourteen colours*) but the text is equally good.

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* *Stanford's Compendium of Geography and Travel*, based on Hellwald's "Die Erde und ihre Volker,"—*Europe*, by F. W. Rudler, F.G.S., and Geo. G. Chisholm, B.Sc. Edited by Sir Andrew C. Ramsay, LL.D., F.R.S., with Ethnological Appendix by A. H. Keane, M.A.I. Maps and Illustrations. London: Edward Stanford. 1885.

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SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CCXXXI.] APRIL, 1885. [PRICE FOURPENCE, *or 5s. per ann. post free.*

## A FLOATING MID-ATLANTIC METEOROLOGICAL OBSERVATORY.

INASMUCH as most of the changes in British weather are due to the passage of cyclonic systems which are traversing this quadrant of the globe from some Westerly towards some Easterly point, it is obvious, and generally recognized, that it is more difficult to forecast the weather which will occur on the West coast of Ireland than in any part of Europe.

It has never seemed to us a very wise arrangement that this forecasting should be done in the extreme *East* of the British Isles, in London, instead of at a Western centre such as Galway; but that is not the point now before us.

The great difficulty in forecasting British weather is the lack of information from the Westward. Excepting the Azores (and they are so far South as to be of little use), there is nothing but ocean West of Ireland until we reach Newfoundland.

Let us not, however, be misunderstood and said to be adverse to the establishment of regular communication with the Azores. By itself we believe that a daily telegram from the Azores would be, as we have said, "of little use" in forecasting British weather; but we think that it would be quite otherwise as regards the more Southern countries of Europe, and if obtained primarily for their benefit, should certainly be reported to our own office.

From the vast stretch of ocean between Ireland and Newfoundland there has hitherto been only one way of obtaining information, viz., that for which the credit will ever remain due to Mr. Gordon Bennett, of the *New York Herald*, and his clever meteorological assistant, Mr. Collins (who perished in the ill-fated Jeanette expedition). His plan was to combine the information of cyclonic movements on the American Continent as obtained from the Signal Office, with the meteorological data for the ocean as stated in the log books of Transatlantic steamers arriving at ports on the Eastern coast of America; he was thus able to track the cyclones after they left the



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American coast, and hence infer the trajectory which they would probably follow, and their velocity in it.

Collins, as we have said, perished in the Arctic regions. Had he still been alive, we should certainly have heard some comments from him upon the fact that while Mr. Bennett was at his own cost sending the telegrams to this country, they were stated to be useless; and yet, eight years after they were commenced (the first *New York Herald* warning was sent February 14th, 1877*), we find the English Meteorological Office arranging with the American Signal Office for the transmission of telegrams (at whose cost we do not know) with precisely the object for which Mr. Bennett sent them.

All this, however, is introductory to, and justificatory of, what we are going to plead for—viz., a floating Meteorological Observatory in about Latitude 50° N. and Longitude 20° W. Of course, the first remark that will be made upon the proposal is that it is an impossibility, and the second that the idea is a very old one.

We are aware that the depth of the ocean at the above spot is about 2,000 fathoms, about 2¼ miles, and that a mooring chain of that length would be a novelty—but the days when novelties are regarded as impossibilities have surely passed. Is no encouragement to be derived from the fact that broken telegraph cables have been picked up at even greater depths, and raised to the surface. The precise locality is not, however, to be decided wholly on Meteorological considerations, Meteorologists have little chance of raising the necessary funds, and the Observatory must be also a call station for passing vessels and for those in distress, and these conditions may require a different locality.

We start afresh with some more scraps of history. The first must be very incomplete, since we cannot lay hands on any printed account. About twenty years ago an attempt was made to establish a "call station" for merchantmen entering the Channel, by placing a vessel somewhere South of the Lizard, which vessel had telegraphic connection with the main land. We believe that the vessel was not constructed specially for the work, and the connection was so often broken, that eventually the scheme was abandoned.

The idea of establishing electro-telegraphic communication with ships in shallow water is by no means given up. In the Fisheries Exhibition of 1882 there was at least one full size specimen of a connection adapted for a light-ship, and some such connection has actually been fitted to, and is working from the "Sunk" light-ship nine miles distant, to the coast at Walton-on-the-Naze.

At the Fourth Annual Exhibition of Instruments, held by the Royal Meteorological Society, March 21st, 1883, there was an exhibit thus described in the catalogue:—

"78.—Cartoon of a Vessel designed for automatically compressing and storing air by means of the waves of the sea, and for the generation of elec-

* Comptes rendus—Congrès Internationale de Météorologie.—Paris, 1879, p. 110.

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tricity by means of this compressed air. The inventor considers that the vessel can be used as a telegraph ship, and is capable of being moored in 1000 fathoms of water, and connected with the shore at any distance with an electric cable.

"*Exhibited by* C. W HARDING, Assoc. M.I.C.E."

We believe that we are correct in supplementing this by the statement that Mr. Harding had a small vessel built for experimental trial, and that it was moored off the Norfolk coast.

Lastly, but by no means least, we reprint from our excellent contemporary, the *American Meteorological Journal* for March, the article which has led us to draw special attention to the subject—one which, for the reasons stated at the beginning of our paper, is of infinitely more practical importance to us than to our American friends; for such a station would rarely be able to warn them, and on the contrary would almost always be able to help us :—

## METEOROLOGICAL STATIONS IN THE ATLANTIC.

The widespread and increasing interest taken in the information furnished by the U. S. Signal Service, as shown by requests to establish signal stations throughout the country, should be met by establishing meteorological stations in the Atlantic over or near the commercial cable lines, when they would be in communication with both sides of the Atlantic.

The practicability of such stations has been demonstrated by the cable-laying steamship *Faraday*, while laying the cable between France and the United States, and, holding on to the cable, found herself in the course of a cyclone, which passed directly over the vessel without causing her to lose her hold of the cable, and which was at once reported to the European continent, the report giving wind changes and velocity with barometric changes. It is also demonstrated by the light-ship off Frying Pan Shoals, N. C., which is anchored about twenty miles from shore, where it is exposed to the severe storms that occur off the Carolina coast. The value and importance of such stations is apparent; continuous observations could be had, not otherwise accessible; storms could be traced throughout their entire course, and the observations in connection with those of the signal stations on the Atlantic coast would decrease the danger arising from sudden storms.

The steamships of the great ocean lines and others could be warned by signal of storms raging across their path; communication by means of signals could be held with vessels, and vessels reported to owners; proximity of icebergs and wrecks reported, and it might be the means of saving many lives. If but one life were saved, it would compensate for the expense of establishing and maintaining stations. These stations, under control of chief signal officers of the army, and manned by observers of the Signal Service, would add valuable data to the science of meteorology. F. S. COBURN.

*New River Inlet, N. C., January 25.*

To this it may be added that the recording instruments recently brought out by Messrs. Richard Frères will all work on board ship, and thus we could have a floating observatory with continuously recording instruments, a gain of considerable importance.

How many years will the weather forecasters of Europe have to rely upon conjecture, owing to the non-establishment of such an observatory as above suggested?



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# SIXTH ANNUAL EXHIBITION OF THE ROYAL METEOROLOGICAL SOCIETY.

## SUNSHINE AND RADIATION.

YEAR by year with experience accumulating as year succeeds year the exhibitions of this Society become better organized and more nearly perfect. We think it a great pity that they are not, by advertisement or otherwise, made more generally known, for if they were we believe that many persons would run up to town and be well rewarded by the excellence of the collections.

The special subjects this year were Sunshine Recorders and Solar and Terrestrial Radiation Thermometers. In accordance with the usual practice, a short ordinary meeting was held before the opening of the exhibition, and the President, Mr. R. H. Scott, F.R.S., read a paper, giving a brief account of the various instruments and arrangements to be found in the exhibition for the purposes of recording solar and terrestrial radiation, and the duration of sunshine both in regard to its light and its heat; the last-named being obtained by means of the sunshine recorders, which are now pretty generally used. He exhibited twelve monthly maps, showing the percentage proportion of hours of recorded sunshine to the hours the sun was above the horizon in the various districts of the United Kingdom. He stated that the features which strike anyone on examining the maps of sunshine, (which are for the most part for the last five summers and for the last four winters, excluding January to March, 1885, which has not yet expired), are :—*First*, the broad fact that the extreme South-Western and Southern stations are the sunniest. As has already been pointed out, Jersey is undoubtedly the most favoured of our stations in this particular. *Second*, that in the late autumn and winter Ireland is much sunnier than Great Britain, Dublin having absolutely the highest percentage of possible duration of sunshine in November and December, and being only equalled by Jersey in January. The Dublin instrument is not situated in the city, but at the Mountjoy Barracks, in the Phœnix Park, beyond the Vice-Regal Lodge. The North-East of Scotland is also exceptionally bright, as the station, Aberdeen, lies to leeward of the Grampians. In April the line of 40 per cent. of possible duration includes Jersey, Cornwall, Pembrokeshire, the Isle of Man, and the whole of Ireland, except Armagh. The absolute maximum of the year occurs in May, and the amount rises to 50 per cent. (nearly to 60 in Jersey) over the district just mentioned as enjoying 40 per cent. in April. In June there is a falling off, which is continued into July, and even into August in the Western Highlands. In the South of England, however, a second maximum occurs in August, the figure for Jersey rising to 50 per cent. This is mainly due to the exceptionally bright weather of August, 1884, in the Southern Counties of England. In September Ireland shows a falling off, and the greatest degree of

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cloudiness is in Lincolnshire. In October the Midland Counties of England are the worst off. In November the line of 40 per cent. encloses two districts; one Dublin, already mentioned; the other the Eastern Counties (Cambridge and Beccles). The absolutely highest monthly percentages in the period under consideration are in the month of May, 1882, in which St. Anne's Head, Milford Haven, had 62 per cent., while Geldeston (Beccles), Douglas (Isle of Man), and Southbourne (Bournemouth), show 61 per cent.

By the kind permission of the Institution of Civil Engineers the Exhibition was held in their library, and it remained open from the evening of March the 18th until that of the 20th.

Among the features in the organization, which we regard as distinct improvements, we quote (1) the classification of the instruments both on the tables and in the catalogue; (2) the (with one flagrant exception) rejection of all duplicates; and (3) the introduction of brief popular notes on the respective groups of exhibits.

The catalogue fills eight closely-printed pages, and shows no signs of the rapidity with which it was written and printed. Remarkably good as it is, there is still room for improvement, *e.g.*, what can anyone (who did not visit the exhibition) learn from such entries as—

56. **Davis's Self-timing Anemometer,** for self-recording the current of air in mines, furnaces, &c. The indications are per second or per minute, and the use of a watch is dispensed with.
*Exhibited by* Messrs. JOHN DAVIS AND SON.

57. **Meteorologist's Wind Vane or Anemoscope.**
*Exhibited by* G. M. WHIPPLE, B.Sc., F.R.Met.Soc.

Considerations of space, of cost, and of time necessarily prevent the catalogue being thoroughly descriptive, but we are glad to hear that an illustrated edition of it will probably appear, and we hope that the opportunity will be seized to add to more of the titles references to publications in which the objects are fully described.

The following paragraphs will give a general notion of the instruments exhibited, but there were many, especially in the miscellaneous class, to which no reference is made. We may notice especially (38) Winstanley's Radiograph, a crude but very suggestive instrument, and the cloud photographs, which formed exhibits (74) and (75), the former being from the vicinity of the Lick Observatory in California, 4250ft. above sea level, and the others taken by Mr. G. W. Ormerod, F.R.Met.Soc. at Teignmouth.

## SUNSHINE RECORDERS.

The first attempt at obtaining an instrumental record of the amount of sunshine was made by Mr. J. F. Campbell, of Islay, in the year 1854, when he mounted a hollow glass sphere filled with acidulated water in the centre of a cup of mahogany so arranged that the sun's rays were focussed on the interior of the cup and burned it. The lines of burning therefore indicated the existence of sunshine.

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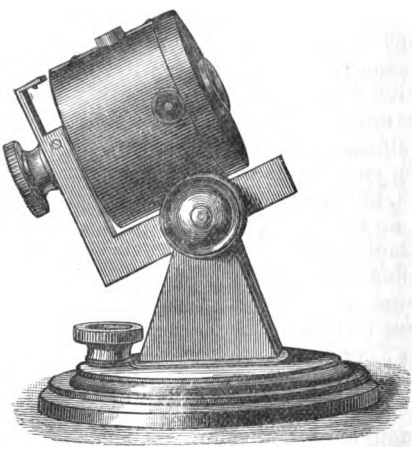
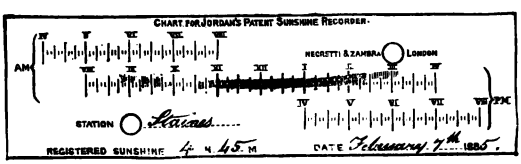
Solid glass spheres were substituted for the hollow ones in 1857, and cards in metal frames (1875) have replaced the wood; but in its principle the sunshine recorder of 1885 differs little from that erected on Richmond-terrace, Whitehall, thirty years ago.

Other modes of recording sunshine are based on the action of the rays of the other end of the spectrum, of the actinic, instead of the heat, rays. Among workers in this direction may be mentioned Marchand of Fécamp, Sir Henry Roscoe, and others. The most recent improvements in this direction are those by McLeod and by Jordan. In both the registration is produced by the action of a ray of sunlight on sensitized photographic (ferro-prussiate) paper. We believe that Prof. McLeod's has not advanced beyond the experimental stage—at any rate it is not yet ready for sale—and we are not sure that it ever will be, for it is much more cumbersome and complicated than Jordan's, and does not give so handy a record. However that may be, Jordan's has the advantage of being first in the field, and when to this we add that it is made by Negretti and Zambra, and sold for about one-third of the price of the "burning-recorders," (we are obliged to coin new words to distinguish the old pattern from the new "actinic-recorders") it will be understood that thoroughly well-made instruments of the new pattern are not at all costly.

The apparatus and its manipulation are extremely simple; there is a small brass box, with apertures facing E., S. and W., forming a dark chamber, which is pointed towards the South, and with its axis



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adjustable according to the latitude in which it is used, and to the altitude of the Sun; this adjustment offers no difficulty, as no harm is done by opening the lid for a few seconds and looking to see that the sun's image is falling on the proper part of the printed photographic paper. The daily observation does not take five minutes, and can be made at any time between sunset and sunrise. One has merely to unclamp a screw, take the box indoors, take out the record sheet, put in a new one, and replace the box. At this very early stage the photographic papers are not quite perfect, the fainter portions of the records disappearing when, to make the record permanent, the paper is dipped in water; but this (temporary, we believe,) difficulty is easily surmounted by marking with pen or pencil the extreme limits of colouration after taking the record sheet out of the box, and before dipping it in the water.

Just as the "burning-recorders" have their faults so has this actinic one, but it gives very pretty records (as we ourselves have proved) with very slight trouble, and may fairly be described as a fascinating little apparatus.

### SOLAR RADIATION THERMOMETERS.

The successive stages in the assumed perfecting of this instrument have been as follows:—An ordinary mercurial thermometer acts as a spherical mirror, and reflects the rays which fall upon it. To lessen this the bulbs were first made with black glass; moreover, originally the degree marks were put upon the supporting slab, then they were put upon the tubes of the thermometers.

It was then found that in a position where two thermometers with similarly coated bulbs were exposed to the sun, but one was exposed to more wind than the other, the indicated temperatures varied greatly. To avoid this it was proposed that the thermometer should be inserted in a glass shield exhausted of air. Various forms of mounting have been adopted, but the chief efforts have been expended in determining the influence of the amount of air left in the so-called vacuum. The next stage was, that inasmuch as black glass has a bright surface there was still much heat reflected, and therefore the surface was dulled with a coat of lamp black—so that all heat falling upon the bulb might be absorbed. Subsequently, owing to the influence of the lower temperature of the unblackened thermometer tube, about 1 in. of it was coated like the bulb.

As evidence of the degree of exhaustion, a small mercurial pressure gauge was attached to the thermometer by one firm, and by other makers platinum wires were soldered through the shield so that the stratification of the electric arc might indicate the amount of air still left in the so-called vacuum.

### TERRESTRIAL RADIATION THERMOMETERS.

The pattern of minimum thermometer used for measuring terrestrial radiation has varied very little. The Rutherford minimum has

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almost always been used, but its sensitiveness has gradually been increased; the spherical bulb was replaced by a cylinder, the cylinder was elongated and bifurcated, and eventually, in order to strengthen the forks, they were united into what is known as a "link."

Another plan was to flatten the cylindrical bulb into as thin a plate as possible, this giving a maximum of surface in proportion to the contents.

The bulb was also made as a double cylinder, and thus we have the so-called "bottle" pattern, and then the tube was led into the side of the bottle, and both of its ends were left open, and so we have the "open cylinder"—a remarkable specimen of glass blowing.

Then there have been two patterns of mercurial thermometers, Casella's and Negretti's.

Difficulties have arisen from the degree marks being obliterated by the weather. To guard against this, the tube has been enclosed in what is known as Leach's shield, and many attempts have been made to render the joint at the entrance of the tube water tight. This is not easy, because the thermometer is exposed to a great range of temperature, and the air inside the shield varies so much in volume that it forces its way through almost every joint. The object has, however, lately been effected by sealing the external jacket on the stem near the bulb, a feat in glass blowing formerly declared to be impossible with enamelled tubes, owing to the difference of expansion of the transparent and of the opal glass.

## THE CLIMATE OF BAYONNE.*

THE Observatory of Saint Martin-de-Hinx is situated about a dozen miles inland, and slightly to the North of Bayonne, at an elevation of about 130 ft. above the sea. It is, therefore, in the extreme S.E. corner of the Bay of Biscay, and with the Cantabrian and Pyreneean ranges of mountains forming a long ridge to the south of it. The director of the Observatory, M. Carlier, is a thoroughly careful man; the station is one of M. Mascart's Second Order Stations, the results being regularly published by him in the *Annales*; and observations are made every three hours with the exception of midnight and three a.m.; besides which the Observatory is furnished with some continuously recording instruments.

For these reasons a summary of the results for twenty years from this Observatory commands attention as a valuable contribution to our knowledge of the meteorology of the S.W. of France.

We may explain, before discussing the data, that the whole pamphlet of 32 quarto pages is lithographed and copiously illustrated by diagrams. From it we have extracted some of the salient features, have converted them into English measures, and in the case of the

* *Comparaison de Vingt Années. Observations Météorologiques faites à Saint-Martin-de-Hinx, France (Landes).* Par H. CARLIER, 1er Décembre, 1864, au 30 Novembre, 1884. Bayonne, 1885. 4to.

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barometer have also applied a rough correction for its altitude (131 ft.); the outcome of these operations being the two following tables, one giving monthly means and the other annual values for each of the twenty years.

*Monthly values for St. Martin-de-Hinx.*

| | Mean Sea Level Pressure. | Mean Temp. | Mean No. of Frosts. | Mean Humidity. | Mean Amount of Cloud. | Rain. | |
|---|---|---|---|---|---|---|---|
| | | | | | | Amount. | Days. |
| | in. | ° | | | | in. | |
| January ... | 30·14 | 43·9 | 9 | 82 | 6·4 | 4·47 | 16 |
| February.. | 30·13 | 46·9 | 5 | 78 | 6·3 | 3·81 | 15 |
| March..... | 30·02 | 48·9 | 3 | 76 | 6·4 | 4·21 | 19 |
| April ..... | 29·98 | 54·2 | 0 | 76 | 6·6 | 4·81 | 17 |
| May ..... | 30·02 | 59·5 | 0 | 75 | 6·0 | 3·74 | 16 |
| June ..... | 30·09 | 64·2 | 0 | 77 | 6·1 | 4·72 | 15 |
| July ..... | 30·09 | 68·2 | 0 | 77 | 5·4 | 3·16 | 13 |
| August ... | 30·07 | 68·2 | 0 | 78 | 5·2 | 2·79 | 12 |
| September | 30·06 | 64·6 | 0 | 80 | 5·8 | 5·82 | 14 |
| October ... | 30·04 | 57·1 | 0 | 82 | 6·4 | 6·34 | 18 |
| November. | 30·07 | 49·0 | 4 | 82 | 6·6 | 5·56 | 18 |
| December. | 30·09 | 42·9 | 11 | 82 | 6·9 | 5·20 | 17 |
| Year ... | 30·07 | 55·6 | 32 | 79 | 6·2 | 54·63 | 190 |

*Annual values for St. Martin-de-Hinx.*

| | Mean temp. | Total No. of Frosts. | Prevailing wind. | Rain. | |
|---|---|---|---|---|---|
| | | | | Amount. | Days. |
| | ° | | | in. | |
| 1864–5 | 57·5 | 20 | W.N.W. | 57·92 | 194 |
| 1865–6 | 56·3 | 32 | W.N.W. | 53·04 | 230 |
| 6–7 | 57·5 | 22 | W. | 48·74 | 219 |
| 7–8 | 56·6 | 36 | N.N.W. | 48·43 | 182 |
| 8–9 | 57·6 | 15 | W.S.W. | 51·69 | 177 |
| 1869–70 | 56·1 | 41 | W. | 40·68 | 159 |
| 1870–71 | 55·8 | 46 | N.E. | 52·40 | 191 |
| 1–2 | 55·9 | 31 | W.S.W. | 55·91 | 191 |
| 2–3 | 57·1 | 16 | W.S.W. | 57·87 | 205 |
| 3–4 | 56·3 | 51 | N.N.E. | 45·04 | 167 |
| 4–5 | 55·5 | 34 | S.W. | 61·02 | 192 |
| 5–6 | 53·6 | 53 | S.S.W. | 40·55 | 166 |
| 6–7 | 56·4 | 14 | W.N.W. | 58·20 | 204 |
| 7–8 | 55·2 | 36 | S.W. | 61·58 | 204 |
| 8–9 | 54·1 | 16 | W.N.W. | 75·02 | 213 |
| 1879–80 | 53·4 | 59 | W.N.W. | 53·12 | 165 |
| 1880–81 | 55·6 | 18 | N.N.W. | 48·43 | 199 |
| 1–2 | 54·1 | 42 | N.W. | 74·68 | 187 |
| 2–3 | 54·4 | 29 | N.W. | 66·05 | 198 |
| 3–4 | 54·7 | 31 | N.N.E. | 42·52 | 151 |
| Mean ..... | 55·6 | 32 | W.N.W. | 54·63 | 190 |
| Max. .. ... | 57·6 | 59 | — | 75·02 | 230 |
| Min. ..... | 53·4 | 15 | — | 40·55 | 151 |

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We add a few remarks which would not go into the tables.

As regards the barometric range, it is, of course, far smaller than in England.

| | St. Martin-de-Hinx. | | London. | Difference. |
|---|---|---|---|---|
| | in. | in. | | in. |
| Absolute Max..... | 1878, Jan. 13th, | 30·85 ... | 30·85, 18th Feb., 1873 ... | 0·00 |
| ,, Min..... | 1874, April 11th, | 29·01 ... | 28·33, 24th Jan., 1872 ... | —·68 |
| Extreme range..... | | 1·84 ... | 2·52, ... | +·68 |

The range of temperature is large, owing to the severe frost of January, 1881, on the 16th day of which month the temperature fell to 8°·8, which was several degrees below any other instance in the twenty years. There are, however, several years in which the mean for the month of December or of January has been below 37°. The absolute maximum was 103°·5 on July 23rd, 1870. The thermometers are 6 ft. above the ground.

The rain gauge is about 5 ft. above the ground; the average fall is rather large (54·63 in.), about the same as Tavistock, Keswick or Kendal. The wettest year had an excess of 37 per cent. above the mean, and the driest year a deficiency of 26 per cent. below it, a range of 63 per cent.

The air is sometimes very dry. We notice that on July 23rd, 1870, the humidity is given as only 12, and there are several months in which it has fallen to 15 and 16.

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## THE CLIMATE OF MARLBOROUGH (WILTS.)

By one of those coincidences which have always a certain amount of drollery about them, we were writing the abstract of M. Carlier's twenty years' work near Bayonne when Mr. Preston's summary of twenty years' work at Marlborough* arrived. It will add to the interest of each, to treat the latter as nearly as possible in the same manner as the former, and in the same number of this Magazine.

We are compelled to make some differences, but they are not serious; we cannot give the barometer, because a change was apparently adopted about 1873–75, and while previously the values were given uncorrected for altitude, after about that period they appear to be corrected. And we cannot give the wind, inasmuch as this volume does not mention it—but a great store of useful values remains.

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* *Results of Twenty Years' Observations on Botany, Entomology, Ornithology and Meteorology taken at Marlborough College*, 1865–84. Oblong 4to 52 pages. [No name of author, printer or publisher, no place and no date].

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*Monthly Values for Marlborough.*

| | Mean Temp. | Mean No. of Frosts. | Mean Amount of Cloud. | Rain. | |
|---|---|---|---|---|---|
| | | | | Amount. | Days. |
| | ° | | | in. | |
| January ... | 37·5 | 11 | 7·5 | 3·55 | 17 |
| February .. | 39·6 | 9 | 7·9 | 2·77 | 17 |
| March .. ... | 40·1 | 13 | 7·0 | 2·06 | 14 |
| April ..... | 41·5 | 5 | 6·9 | 2·26 | 14 |
| May... . ... | 50·3 | 3 | 6·5 | 2·15 | 12 |
| June .. .... | 56·4 | 0 | 6·8 | 2·44 | 13 |
| July..... ... | 60·0 | 0 | 6·6 | 2·84 | 14 |
| August ... | 59·2 | 0 | 6·2 | 3·11 | 14 |
| September. | 55·4 | 0 | 6·5 | 3·54 | 15 |
| October . | 48·0 | 4 | 7·0 | 3·56 | 17 |
| November. | 41·3 | 10 | 7·0 | 3·24 | 16 |
| December. | 38·4 | 12 | 7·4 | 3·02 | 17 |
| Year ... | 47·3 | 67 | 6·9 | 34·54 | 180 |

To the tabular values we may add that the highest temperature in shade was 92°·0 on August 13th, 1876, and the lowest 1° on January 5th, 1867. The maximum yearly rainfall 43·79 in. in 1882, and the least 23·41 in. in 1870, being respectively 27 per cent. above, and 33 per cent. below the mean, or a range of 60 per cent.

The humidity is not reported for each month, but for the year it is given as 85, or 6 per cent. *more* than at Bayonne, although the rainfall is one third *less.*

We have not touched upon the mass of data (unequalled to our knowledge) respecting natural history given in these tables, as we leave that subject for other journals to whose province it belongs.

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## THE RED SUNSETS.

A NEW way of obtaining an explanation of the above phenomena has been adopted by Mr. Warner, of the Warner Observatory, Rochester, New York, and is mentioned on pages 454, 455 of the *American Meteorological Journal.* Mr. Warner writes :—

"I will give a prize of two hundred dollars (about £42) to any person in the world who will write the best 3,000-word paper on the cause of the atmospheric effects (red light, &c.) accompanying sunset and sunrise during the past sixteen months. It is desired that these papers be as original as possible, both in facts, observation, and treatment.

"Essays must be exclusively sent prepaid to Dr. Lewis Swift, Director, Warner Observatory, Rochester, New York, must be written in English, on one side of the paper only, and must be in the simplest, untechnical phrase. Each competitor must sign a *nom de plume* to his essay, and enclose his real name and address in an envelope, superscribed with his *nom de plume.* The essays must be in Dr. Swift's hands by December 1, 1885.

"Three disinterested scientists will be selected to determine the result.

"H. H. WARNER.

"*Rochester, New York, January 17th, 1885.*"

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 81·5 | 18 | 40·6 | 30 | 68·8 | 52·3 | 53·8 | 82 | 116·6 | 33·6 | 1·77 | 15 | 5·8 |
| Malta | 90·1 | 26 | 62·2 | 22 | 81·2 | 67·5 | 64·3 | 73 | 140·3 | 57·6 | 0·54 | 2 | 2·0 |
| *Mauritius* | 80·5 | 22 | 57·5 | 29 | 77·0 | 63·8 | 59·4 | 71 | 130·6 | 49·6 | 1·19 | 15 | 5·1 |
| Calcutta | 89·4 | 17* | 74·1 | 6 | 85·7 | 76·7 | 76·8 | 87 | 154·8 | 69·8 | 16·63 | 20 | 7·4 |
| Bombay | 85·8 | 9 | 73·1 | 27 | 83·3 | 75·7 | 75·8 | 89 | 143·6 | 71·1 | 17·04 | 26 | 8·0 |
| Ceylon, Colombo | 85·5 | 11 | 74·8 | 22 | 84·1 | 74·3 | 73·0 | 82 | 143·2 | 65·0 | 5·45 | 17 | 6·8 |
| *Melbourne* | 79·0 | 9 | 35·0 | 17 | 64·4 | 45·4 | 41·0 | 63 | 131·6 | 28·7 | 0·68 | 8 | 5·7 |
| *Adelaide* | 82·0 | 18 | 40·9 | 14 | 65·8 | 49·1 | 44·4 | 62 | 138·1 | 31·3 | 2·63 | 16 | 5·3 |
| *Wellington* | 65·0 | 26 | 34·4 | 15 | 56·6 | 45·3 | ... | ... | 128·0 | 29·0 | 5·86 | 17 | ... |
| *Auckland* | 65·0 | 3 | 40·0 | 19 | 59·9 | 49·1 | 45·6 | 72 | 133·0 | 33·0 | 3·27 | 20 | 7·0 |
| Jamaica, Kingston | 92·7 | 18 | 71·9 | 10 | 88·7 | 74·0 | 73·2 | 79 | ... | ... | 3·33 | ... | 6·5 |
| Barbados | 85·0 | 6† | 71·0 | var. | 83·0 | 73·0 | 75·9 | 85 | 147·0 | ... | 3·38 | 16 | 5·0 |
| Toronto | 85·2 | 10 | 34·9 | 19 | 71·5 | 51·6 | 55·5 | 77 | 137·0 | 29·5 | 3·19 | 16 | 5·2 |
| New Brunswick, Fredericton | 84·7 | 4 | 30·5 | 14‡ | 66·9 | 44·0 | 48·9 | 77 | ... | ... | 3·91 | 14 | 5·1 |
| Manitoba, Winnipeg | 70·6 | 1 | 36·7 | 25 | 59·4 | 43·2 | 46·3 | 82 | ... | ... | 3·75 | 15 | 5·6 |
| British Columbia, Victoria | 65·0 | 6 | 35·0 | 26 | ... | ... | ... | ... | ... | ... | 1·66 | 14 | ... |

* And 20. † And 7, 21. ‡ And 15.

### REMARKS, SEPTEMBER, 1884.

MALTA.—Mean temp. 73°·5; mean hourly velocity of wind 8·1 miles; sea temp. fell from 78° to 76° by the 10th, and remained stationary to the end. TS on the 13th, L on 11th and 12th. J. SCOLES.

*Mauritius.*—Rainfall 0·37 in., mean temp., 0°·1 and mean hourly velocity of wind 2·2 miles, below their respective averages. Prevailing winds S.E. by E., to E. by S. Coloured skies before sunrise and after sunset throughout, but of shorter duration and less intensity than formerly. C. MELDRUM, F.R.S.

*Melbourne.*—Mean temp. 1° above the average; rainfall 1·65 in., temp of dewpoint 2°·6, humidity 8, and amount of cloud ·4 below their respective averages; pressure average. Prevailing winds N. and W., strong on 7 days; H on two days, hoar frost on three, L on three. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure and temp. slightly, and rainfall and amount of cloud, considerably, above average. R fell as far N. as lat 28°, and well over the N.E. and N.W., pastoral areas and the N. agricultural districts during the latter part of the month reviving the crops, which were looking sickly. C. TODD.

*Wellington.*—Fine from 4th to 11th; remainder of the month showery and unsettled. Rainfall 1·23 in. above average, temp. 0°·3 below it. R. B. GORE.

*Auckland.*—Showery and disagreeable weather throughout, but total rainfall not in excess. Heavy gales on 3rd, 14th and 30th. T. F. CHEESEMAN.

*Kingston.*—Rainfall still below average, and distributed very irregularly over the Island. In the Blue Mountain district, springs and watercourses are lower than was ever known before, and vegetation is much burnt up. Earthquake at 9.58 p.m. on Sept. 6th, at Montego Bay, Mount Charles, and Windsor simultaneously. Prevailing wind S.E.; mean hourly velocity 3 miles. MAXWELL HALL.

BARBADOS.—Mean temp. (77°·1) about the average. Pressure steady; rainfall below the average. N.E. winds on 27 days, average velocity 7·1 miles per hour, extremes 9·8 miles and 4·2 miles. Six days overcast. TS on the 11th. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·34 | XI. | Rhayader, Nantgwillt.. | 3·06 |
| ,, | Margate, Birchington... | ·92 | ,, | Carno, Tybrith ... ..... | 1·58 |
| ,, | Littlehampton .. ..... | 2·08 | ,, | Corwen, Rhug ..... | 1·02 |
| ,, | Hailsham ..... | 2·32 | ,, | Port Madoc ..... | 4·44 |
| ,, | I. of W., St. Lawrence. | 1·52 | ,, | I. of Man, Douglas ..... | 3·77 |
| ,, | Alton, Ashdell..... | 1·94 | XII. | Stoneykirk, Ardwell Ho. | 3·64 |
| III. | Winslow, Addington ... | 1·19 | ,, | Melrose, Abbey Gate... | 1·35 |
| ,, | Oxford, Magdalen Col... | 1·10 | XIII. | N. Esk Res. [Penicuick] | 2·00 |
| ,, | Northampton ..... | ·99 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | ·80 | ,, | Glasgow, Queen's Park. | 1·14 |
| ,, | Wisbech, Bank House.. | ·84 | XV. | Islay, Gruinart School.. | 2·14 |
| IV. | Southend ..... | 1.14 | XVI. | St. Andrews, Newton Bk | 2·37 |
| ,, | Harlow, Sheering ... .. | 1·11 | ,, | Balquhidder, Stronvar.. | 5·66 |
| ,, | Rendlesham Hall ..... | 1·01 | ,, | Dunkeld, Inver Braan.. | 1·88 |
| ,, | Diss ..... | 1·14 | ,, | Dalnaspidal H.R.S. ... | 3·86 |
| ,, | Swaffham ..... | 1·28 | XVII. | Keith H.R.S. ..... ..... | 2·45 |
| V. | Salisbury, Alderbury ... | 1·47 | ,, | Forres H.R.S. ..... ... | 1·63 |
| ,, | Warminster ..... | 1·16 | XVIII. | Strome Ferry H.R.S.... | 5·10 |
| ,, | Calne, Compton Bassett | 1·29 | ,, | Lochbroom ..... | 4·49 |
| ,, | Ashburton, Holne Vic.. | 2·82 | ,, | Tain, Springfield..... | 1·43 |
| ,, | Holsworthy, Clawton... | 1·72 | ,, | Loch Shiel, Glenaladale | 9·31 |
| ,, | Hatherleigh, Winsford. | 2·53 | ,, | Invergarry ..... | 5·26 |
| ,, | Lynmouth, Glenthorne. | 1·29 | XIX. | Lairg H.R.S. ..... | 1·65 |
| ,, | Probus, Lamellyn ..... | 1·96 | ,, | Forsinard H.R.S. ..... | 2·14 |
| ,, | Wincanton, Stowell Rec. | 1·42 | ,, | Watten H.R.S. ..... | 1·71 |
| ,, | Wells, Westbury..... | 1·14 | XX. | Dunmanway, Coolkelure | 4·56 |
| VI. | Bristol, Clifton ..... .. | 1·22 | ,, | Fermoy, Gas Works ... | 2·85 |
| ,, | Ross ..... | 1·44 | ,, | Tralee, Castlemorris ... | 2·62 |
| ,, | Wem, Sansaw Hall..... | ·99 | ,, | Tipperary, Henry Street | 3·11 |
| ,, | Cheadle, The Heath Ho. | 1·60 | ,, | Newcastle West ..... | 1·12 |
| ,, | Worcester, Diglis Lock | 1·13 | ,, | Miltown Malbay..... | 3·46 |
| ,, | Coventry, Coundon ..... | 1·11 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | ·79 | XXI. | Carlow, Browne's Hill.. | 2·04 |
| ,, | Ketton Hall [Stamford] | 1·22 | ,, | Navan, Balrath ..... | 1·29 |
| ,, | Horncastle, Bucknall ... | ·96 | ,, | Mullingar, Belvedere ... | 2·54 |
| ,, | Mansfield, St. John's St. | 1·42 | ,, | Athlone, Twyford ..... | 3·22 |
| VIII. | Macclesfield, The Park. | 2·26 | XXII. | Galway, Queen's Col.... | 1·66 |
| ,, | Walton-on-the-Hill..... | 2·13 | ,, | Clifden, Kylemore ..... | 10·22 |
| ,, | Lancaster, South Road. | 3·57 | ,, | Crossmolina, Enniscoe.. | 4·40 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 1·83 |
| IX. | Wakefield, Stanley Vic. | 1·16 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·20 | ,, | Rockcorry..... | ... |
| ,, | Scarborough..... | 1·52 | ,, | Warrenpoint ..... | 3·18 |
| ,, | East Layton [Darlington] | 2·07 | ,, | Newtownards ..... | 2·11 |
| ,, | Middleton, Mickleton .. | 1·77 | ,, | Belfast, New Barnsley . | 3·27 |
| X. | Haltwhistle, Unthank.. | 2·34 | ,, | Cushendun ..... | 3·84 |
| ,, | Shap, Copy Hill ..... | 4·88 | ,, | Bushmills ..... ..... | 1·82 |
| XI. | Llanfrechfa Grange . ... | 1·89 | ,, | Stewartstown ..... | 1·74 |
| ,, | Llandovery ..... | 1·75 | ,, | Buncrana ..... | 2·52 |
| ,, | Castle Malgwyn ..... | 2·31 | | | |

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# MARCH, 1885.

| Div. | | STATIONS. (The Roman numerals denote the division of the Annual Tables to which each station belongs.) | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32° In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·65 | + ·04 | ·74 | 21 | 7 | 62·6 | 20 | 26·5 | 8 | 12 | 24 |
| II. | | Maidstone (Hunton Court)... | 1·39 | — ·19 | ·59 | 22 | 6 | ... | ... | ... | ... | .. | ... |
| ,, | | Strathfield Turgiss ..... | 1·97 | + ·57 | ·76 | 22 | 11 | 62·2 | 20 | 21·9 | 9 | 15 | 24 |
| III. | | Hitchin ..... | 1·12 | — ·36 | ·48 | 3 | 6 | 58·0 | 29 | 25·0 | 1*a* | 22 | ... |
| ,, | | Banbury ..... | ·92 | — ·68 | ·36 | 3 | 9 | 57·0 | 20 | 24·0 | 8 | 15 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·10 | — ·46 | ·49 | 3 | 11 | 58·0 | 20 | 23·0 | 30 | 22 | ... |
| ,, | | Norwich (Cossey) ..... | 1·29 | — ·40 | ·51 | 3 | 13 | 56·5 | 20 | 24·0 | 22 | 17 | 24 |
| V. | | Weymouth(LangtonHerring) | 1·49 | ... | ·61 | 3 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple ..... | 1·92 | — ·57 | ·42 | 21 | 13 | 54·0 | 5 | 28·0 | 8 | ... | ... |
| ,, | | Bodmin ..... | 2·57 | — ·59 | ·54 | 2 | 14 | 52·0 | 3*b* | 30·0 | var. | 6 | 18 |
| VI. | | Stroud (Upfield) ..... | 1·26 | — ·55 | ·44 | 21 | 12 | 58·0 | 4*c* | 26·0 | 7 | 10 | ... |
| ,, | | ChurchStretton(Woolstaston) | 1·36 | — ·80 | ·28 | 29 | 16 | 54·0 | 17 | 26·5 | 10*d* | 15 | 21 |
| ,, | | Tenbury (Orleton) ..... | 1·28 | — ·59 | ·33 | 21 | 14 | 57·0 | 20 | 24·3 | 8 | 16 | 18 |
| VII. | | Leicester ... ..... | 1·14 | ... | ·18 | 3 | 16 | 56·2 | 17 | 26·2 | 15 | 12 | 27 |
| ,, | | Boston ..... | ·83 | — ·46 | ·38 | 3 | 7 | 55·0 | 15 | 29·0 | 22 | 11 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·83 | + ·17 | ·44 | 5 | 14 | 53·5 | 20 | 30·0 | 7*e* | 5 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·07 | ... | ·31 | 3 | 14 | 55·0 | 28 | 25·0 | 2 | 16 | ... |
| VIII. | | Manchester (Ardwick)..... | 2 25 | — ·20 | ·43 | 3 | 15 | 51·0 | 4*g* | 29·0 | 7*f* | 14 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·59 | — ·54 | ·42 | 4 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 4·91 | + ·15 | 1·01 | 31 | 15 | 53·0 | 14 | 25·0 | 14 | 17 | ... |
| X. | | North Shields ..... | 2·22 | + ·77 | ·43 | 4 | 14 | 56·8 | 20 | 26·0 | 31 | 17 | 18 |
| ,, | | Borrowdale (Seathwaite)..... | 14·86 | + 4·97 | 2·90 | 31 | 19 | 52·9 | 13 | 25·5 | 22 | 5 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·17 | — ·52 | ·60 | 29 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·39 | + ·20 | 1·00 | 31 | 12 | 53·0 | 3*f* | 24·5 | 7 | 14 | 19 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 3·20 | ... | ·70 | 31 | 12 | ... | ... | ... | ... | .. | ... |
| ,, | | Llandudno..... | 1·88 | ·00 | ·28 | 20 | 12 | 55·6 | 26 | 31·0 | 7 | 3 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... ... | 2·26 | — ·52 | ·56 | 31 | 11 | 52·0 | 14*f* | 25·0 | 1*g* | 16 | ... |
| ,, | | Jedburgh (Sunnyside)..... | 1·34 | — ·23 | ·52 | 29 | 8 | 53·0 | 14*h* | 23·0 | 23 | 17 | ... |
| XIV. | | Douglas Castle (Newmains) | 2·73 | — ·41 | ·89 | 31 | 10 | ... | ... | ... | .. | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 4·00 | — ·61 | ·82 | 28 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 3·64 | ... | 1·18 | 31 | 12 | 54·0 | 13 | 27·0 | 9 | 5 | ... |
| ,, | | Mull (Quinish)..... | 3·73 | ... | ·89 | 31 | 16 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·90 | + ·78 | ·80 | 4 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 2·02 | + ·39 | ·73 | 29 | 7 | 52·0 | 20 | 27·0 | 23 | 10 | ... |
| XVII. | | Braemar ..... ... | 1·74 | — ·45 | ·33 | 28 | 18 | 49·8 | 13 | 21·0 | 28 | 25 | 31 |
| ,, | | Aberdeen ..... ... | 1·57 | ... | ·45 | 29 | 21 | 53·0 | 13*j* | 27·0 | 20 | 12 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 1·31 | — ·44 | ... | ... | ... | 55·0 | 26 | 26·3 | 23 | 10 | 24 |
| XIX. | | Dunrobin ..... | 2·27 | ... | ·72 | 17 | 15 | 53·0 | 23 | 23·0 | 9 | 12 | ... |
| ,, | | Orkney (Sandwick)..... .. | 2·63 | — ·01 | ·40 | 31 | 23 | 48·6 | 21 | 26·4 | 21 | 6 | 15 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 3·50 | + ·74 | 1·08 | 2 | 12 | 60·0 | 26 | 27·0 | 30 | 13 | ... |
| ,, | | Dromore Castle ..... | 3·40 | ... | ·70 | 31 | 12 | 57·0 | 27 | 29·0 | 15 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 3·15 | ... | ·84 | 28 | 13 | 56·5 | 20 | 23·0 | 7 | 14 | 26 |
| ,, | | Killaloe ..... | 2·29 | ... | ·80 | 31 | 13 | 53·0 | 23 | 27·0 | 10*h* | 15 | ... |
| XXI. | | Portarlington ..... ..... | 1·79 | — ·37 | ·55 | 28 | 20 | 44·0 | 3 | 26·5 | 11 | 13 | ... |
| ,, | | Dublin (FitzWilliam Square) | 1·53 | -- ·20 | ·31 | 3 | 13 | 58·6 | 26 | 29·0 | 12*h* | 10 | 20 |
| XXII. | | Ballinasloe ..... ..... | 2·07 | - ·31 | ·52 | 28*g* | 17 | 52·0 | 26 | 22·0 | 10 | 18 | ... |
| XXIII | | Waringstown ..... ..... | 2·00 | — ·06 | ·60 | 28 | 13 | 57·0 | 26 | 22·0 | 9*h* | 17 | 23 |
| ,, | | Londonderry (Creggan Res.). | 2·60 | ... | ·57 | 28 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 2·18 | + ·09 | ·60 | 31 | 17 | 50·0 | 26 | 26·0 | 11 | 14 | ... |

9, 11. *b* And 20, 31. *c* And 5. *d* And 19. *e* And 22, 28. *f* And 20. *g* And 31. *h* And 15. *i* And 10, 12, 19. *j* And 14, 17, 20.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—A splendid month for agricultural purposes, tillage and seeding most favorably completed. The frosts at night imposed a healthy check on vegetation, and prevented too early opening of fruit bloom. Nettle tortoiseshell butterfly seen flying on 27th; frog spawn seen on 16th, marsh marigold in flower on the 9th, broom on 20th, plum on 25th.

BANBURY.—A favourable month for agricultural operations; hawthorn buds which were showing at the end of February had not fully expanded at the close of March. Mean temp. 39°·6. Mean amount of cloud at 9 a.m. 5·6. S on 3 days, high wind on 2, fog on 1, distant T on 24th.

CULFORD. A fine dry month, with cold winds and frequent sharp frosts which checked vegetation. Fruit prospect good.

LANGTON HERRING.—A dry cold month, favourable for farming operations. With the exception of March 1883 this was the coldest March for 14 years. Mean pressure above average. Solar halo on the 5th.

BODMIN.—A fine seasonable month. Mean temp. 41°·4, the lowest recorded for 36 years.

STROUD.—A fine dry month, with cold winds; S on 4th and 21st; H and sleet on 18th.

WOLSTASTON.—A cold month with sharp frosts at night during the greater part. S on 5th and 21st. Mean temp. 39°·5.

ORLETON.—Although frosty nights and fine days prevailed during the greater part of the month, the mean temp. was only 0°·5 below the average of 24 years. Pressure high and generally steady, although there were frequent gales of wind. A fall of S occurred on the night of the 21st, covering the ground to the depth of nearly 3 inches, but it soon disappeared on the 22nd. The land was in a very favourable state for the planting of spring crops. Prevailing winds N. and E.

KILLINGHOLME.—A cold month with no gales, dry after the first week. The ground was well pulverised for sowing, but R was wanted for the seed to germinate and for the pastures Vegetation backward.

MANCHESTER.—On the whole a fine seasonable month, with many cold and frosty nights keeping back vegetation, and making spring more hopeful, for in this district a late spring is always the best.

## WALES.

HAVERFORDWEST.—The first four days of the month were gloomy, cold and wet, after which the weather became fine and clear, with sharp night frosts and keen N.E. winds up to the 16th; the weather then became changeable, but was still very cold with frosty nights, and the month ended stormy, boisterous, and cold. Prevailing winds E.N.E. and S.E. Mean temp. somewhat below the average; pressure high about the middle of the month. Scarcely any primroses, and grass lands very bare.

LLANDUDNO. - On the whole a fine month for March, with mean temp. rather more than 1° below the average. There were many fine bright days, and, with the exception of the 17th, 18th and 29th, there was no very stormy weather. Range of temp. about the average.

## SCOTLAND.

CARGEN.—Strong winds prevailed at the commencement and towards the end of the month. Mean temp (39°·0), 2°·2 below the average; pressure 0·222 in. above the average.

JEDBURGH.—The weather was dry, with remarkably cold winds, causing the finest seed-time for many years. Vegetation much retarded, and spring flowers much affected by frost. S on the 4th, 18th and 29th.

OBAN.—The month was unusually dry, with low temp. The latter part of the month was somewhat disturbed by moderate gales on the 16th, 20th, 26th,

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28th and 31st; the last being the worst, and producing a very heavy rainfall S on 21st, H on 31st.

QUINISH.—From the 1st to the 15th very fine, with occasional slight frost; thereafter cold, stormy, and unsettled.

ABERDEEN.—Altogether the weather was dry and open during the month. Rainfall about half-an-inch below the average. Aurora was observed on the nights of the 15th and 16th, after which the weather became squally, and the remainder of the month was unsettled. Lunar corona on the 23rd, H on two days, S on three, sleet on four, hoar-frost once.

CULLODEN.—The weather was dry, cold and ungenial throughout the month. From the commencement to the 24th very little R fell, and frost generally prevailed; no sign of vegetation at the close of the month.

## IRELAND.

DROMORE.—The month on the whole was very fine, in fact one of the best Marches for some years.

WATERFORD.—Rainfall slightly above the average; S on 17th; H on 8th; fog on 26th.

KILLALOE.—A very favourable month for spring operations. Mean temp. (40°·9) below the average with many night frosts. The weather at the close of the month was very wintry and severe.

DUBLIN.—A cold, generally dry month. Searching "polar" winds prevailed to a large extent. The mean temp. (40°·7) was 2°·0 below the average. Rainfall and number of rainy days below the average. Mean humidity 82; mean amount of cloud 5·6; prevailing winds W., N.N.E., and N.W. S on 18th; sleet on 10th and 29th; H on 6th, 8th, and 18th; solar halo on 31st; aurora on the 15th; fog on several days.

EDENFEL.—The temp. of the month was low, with frost more or less keen on 14 nights. The greater part of the R fell on the first day, and in the last week, and during the intervening period 13 days were bright, cloudless and cold. Vegetation very backward. S on the 18th.

## THE NEW TIME.

*To the Editor of the Meteorological Magazine.*

SIR,—Is it not premature to come to the conclusion that the New Time is dead and buried? There is a good article on the subject in *The Observatory* for March, written by the Editors, which contains a different opinion, and considers that, so far as astronomy is concerned, the change of reckoning time may suitably be made at a not very distant date. I entirely agree with this article, excepting the writers' suggestion (if I understand it aright) that the general public should make the change at an earlier date than astronomers, in order that the latter might know they were not inconveniencing themselves uselessly. I do not wish unduly to discourage others from making the change before astronomers make it, though I consider it would be more convenient for all to make the change simultaneously. This especially refers to meteorologists and astronomers, as the two sciences so closely touch each other.

So great an authority as Professor Newcomb holds that the change, if made at all, should take place at the commencement of the next century. If that occur, the present reckoning of time would not "survive for generations," as you fear it will. It appears, however, that the final Report of the Prime Meridian Conference has not yet been received, and that therefore the attempt to make the change now is altogether too hasty.

*Sunderland, April 4, 1885.* T. W. BACKHOUSE.

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# SYMONS'S
## MONTHLY
# METEOROLOGICAL MAGAZINE.

CCXXXII.] MAY, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.


## RAINFALL IN MADAGASCAR.

The insertion of the following table is due to a train of circumstances so circuitous as to be worthy of record as an illustration of the difficulty which arises from the absence of well-recognised centres of knowledge.

The representatives of the London Missionary Society issue yearly from the native press of Antananarivo a remarkably well-printed 8vo volume, of about 150 pages, *The Antananarivo Annual and Madagascar Magazine*, a record of information on the topography and natural productions of Madagascar, and the customs, traditions, language, and religious beliefs of its people. The eighth volume, that issued Christmas, 1884, came into the hands of Prof. Michael Foster, Sec. R.S., who wrote a very favourable notice of it, which appeared in a recent number of *Nature*. In this, Prof. Foster mentioned that the volume contained a table of rainfall. Dr. Hann read the review in *Nature*, and wrote to us to suggest that as it was impossible to get a copy of the *Antananarivo Annual* in Vienna, it would be well to reprint the table. We sent Dr. Hann's suggestion to the Secretary of the London Missionary Society, and he has favoured us with a copy of the annual, whence we reprint the article.

The story, however, is not yet ended. It will be seen that Mr. Richardson stated that the early part of 1881 was copied from the records published by the Jesuit Fathers. This started us on a fresh track, as it seemed likely that not only were there two records in Madagascar during recent years, but also that the record of the Jesuit Fathers might go back before 1881. We therefore wrote to the Rev. S. J. Perry, S.J., F.R.S., asking his help. He has no copy himself, and on writing to the French agent of the Jesuit Fathers he says that he fears that the war has destroyed all chance of obtaining information, but that he has written to Taramave to see what can be done:—

### RAINFALL OF ANTANANARIVO FOR FOUR YEARS.

In order to present our readers with a full record of nearly four years, I have taken the amounts from January to September of 1881



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from the record published by the Jesuit Fathers, my own observations having commenced in October of that year. I leave the readers to make their own comparisons. It will be noticed that the fall for the present year has been the heaviest of the four.*

| Month. | 1881. | 1882. | 1883. | 1884. | Average 4 Years. | True Average. |
|---|---|---|---|---|---|---|
| | in. | in. | in. | in. | in. | in. |
| January ... | 12·98 | (23) 12·50 | (30) 16·86 | (25) 11·91 | 13·56 | 13·56 |
| February .. | 4·57 | (11) 6·95 | (16) 7·12 | (22) 12·48 | 7·78 | 7·78 |
| March ..... | 9·50 | (16) 4·01 | (19) 9·04 | (23) 11·54 | 8·53 | 8·52 |
| April ..... | 1·74 | (6) 0·63 | (4) 0·88 | (7) 2·39 | 1·41 | 1·41 |
| May ..... | 0·20 | (4) 0·58 | (4) 1·59 | (3) 1·23 | 0·90 | ·90 |
| June ..... | 0·60 | (0) 0·0 | (1) 0·33 | (?) 0·06 | 0·11 | ·25 |
| July..... | 0·70 | (0) 0·0 | (5) 0·21 | (1) 0·02 | 0·075 | ·23 |
| August ... | 0·10 | (0) 0·0 | (1) 1·07 | (1) 0·12 | 0·32 | ·32 |
| September. | 0·20 | (0) 0·0 | (0) 0·0 | (7) 1·42 | 0·405 | ·41 |
| October .. | (3) 1·97 | (4) 1·72 | (9) 6·38 | (15) 6·66 | 4·70 | 4·18 |
| November. | (6) 2·45 | (11) 7·60 | (12) 6·07 | (13) 6·82 | 5·735 | 5·74 |
| December.. | (13) 7·11 | (15) 7·09 | (15) 9·12 | (24) 14·21 | 9·38 | 9·38 |
| Total | 42·12 | (90) 41·08 | (116) 58·67 | (143) 68·86 | 52·31 | 52·68 |

The rainy season began on October 2nd, 1882, and 1883, and a heavy storm passed over the capital on October 1 (Leap-Year), 1884, when we had ·98 in. in less than 20 minutes; and on October 27th we had 2·25 in. in much less than half an hour.

The figures in brackets give the number of days on which rain fell.

J. Richardson.

*Faravohitra, Jan. 1st, 1885.*

## NOTES ON THE WEATHER OF A CENTURY AGO.

By Charles Tomlinson, F.R.S.

Having had occasion recently to refer to the letters of the poet Cowper, I was struck with his frequent remarks on the weather. It may be some consolation to those persons who imagine that our climate has deteriorated, to find that the poet complained of cold and wet summers, unseasonable springs and winters, pretty much as we do. I am writing these remarks on the 8th of May, by the side of a blazing fire, hail having just whitened the streets, and snow was reported yesterday from Kent. This cold weather is attributed to a multitude of icebergs which have been launched from their Arctic home into the Atlantic, and have converted the "ethereal mildness"

* The author or the printer has gone astray in the last column, which in two or three months will not at all agree with the previous ones. We have, therefore, re-worked the averages, assuming the monthly amounts (which agree with the yearly totals) to be correct. The differences are not essential, but we cannot pass them without notice.

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of our April into a wintry May. Cowper makes the same complaint about icebergs, and suggests that they should be furnished with sails, for the purpose of wafting them down to Equatorial regions; but he was not aware that about seven-eighths of the mass of an iceberg is below the surface of the water, so that our puny efforts would be exerted in vain to remove these tremendous masses.

Our poet records a violent storm on the 9th of May, 1780, during which he watched a crow struggling hard to retain its seat in its nest on the top of a tall tree.

1781. In May of this year, he says that his poems were written during the winter, "Hence it comes to pass that the season of the year which generally pinches off the flowers of poetry unfolds mine, such as they are, and crowns me with a winter garland. In this respect, therefore, I and my contemporary bards are by no means on a par. They write when the delightful influence of fine weather, fine prospects, and the brisk motion of the animal spirits make poetry almost the language of nature; and I, when icicles depend from all the leaves of the Parnassian laurel, and when a reasonable man would as little expect to succeed in verse as to hear a blackbird whistle." On June 5th, 1781, he writes:—"These seasonable showers have poured floods upon all the neighbouring parishes, but have passed us by. My garden languishes, and what is worse, the fields too languish, and the upland grass is burnt."

1782. On the 2nd of February, he says:—"No winter since we knew Olney has kept us more confined than the present. We have not more than three times escaped into the fields since last autumn." In August of the same year he is troubled with floods.

1783. On February 13th, he refreshed himself with a walk in the garden, "where I find that January (who according to Chaucer was the husband of May) being dead, February has married the widow." On June 13th, 1783, he writes:—"We have had more thunderstorms than have consisted well with the peace of the fearful maidens in Olney * * Yesterday morning, at seven o'clock, two fire-balls burst either in the steeple or close to it. William Andrews saw them meet at that point, and immediately after saw such a smoke issue from the apertures in the steeple as soon rendered it invisible. The noise of the explosion surpassed all the noises I ever heard; you would have thought that a thousand sledge-hammers were battering great stones to powder, all in the same instant. The weather is still as hot, and the air as full of vapour as if there had been neither rain nor thunder all the summer." On the 19th he writes:—"The summer is passing away, and hitherto has hardly been seen or felt. Perpetual clouds intercept the influence of the sun, and for the most part there is an autumnal coldness in the weather, though we are almost upon the eve of the longest day." On September 29th he refers to "the ill effects of this unhealthy season."

1784. February 22nd. He expresses congratulations on the thaw, and complains of the frost having frozen the ink in his ink-



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stand. The frost had lasted nine weeks. On July 5th he says that during the whole month of June "we have experienced almost the rigours of winter."

1788. March 19th. "The spring is come, but not I suppose that spring that our poets have celebrated. So I judge at least, by the extreme severity of the season, sunless skies and freezing blasts surpassing all we experienced in the depth of winter." May 6th. "What constitution or what skin can possibly be proof against our vernal breezes in England?" June 17th. "The east and north-east winds breathe winter upon the roses of June." In September he complains that our summers are hardly ever warm or cold enough. "Were they warmer we should not want a fire, and were they colder we should have one."

1792. June 19th. He speaks of the "ice-islands (that is, ice-bergs) that spoil all our summers," to which we have alluded in the beginning of this article.

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## A FLOATING MID-ATLANTIC METEOROLOGICAL OBSERVATORY.

The following extract from the Signal Office *Monthly Weather Review* for January, 1885, is of interest, as almost completely confirming the remarks on page 34 of our last number :—

### SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings in New York and Philadelphia, and in the Custom House at Boston, where the necessary blanks and other information will be furnished to shipmasters.

The following circular explains the object of these agencies :—

UNITED STATES OF AMERICA,
SIGNAL OFFICE, WAR DEPARTMENT,
*Washington City, November 29th, 1884.*

SHIPMASTERS.—It is now generally known that a large percentage of *American storms* travel across the Atlantic, and in a few days after leaving our coast affect the *weather conditions of Europe.* Shipmasters' observations prove this, and Captain Henry Toynbee, Marine Superintendent of Great Britain, who has investigated the subject with much vigor, says : "E.N.E., thirty to forty miles an hour, has been adopted as a rough estimate of the track and speed of storms crossing the Atlantic, until they arrive off the west coasts, when they are affected by the disposition of pressure over western Europe."

How important it is, then, for the shipmaster about to sail to America from European ports to know the *probable weather conditions* he is likely to have on his westward passage, or where he will be likely to encounter a *storm or hurricane at sea.*

The London Meteorological Office will now make an earnest effort to make such predictions, and, in connection therewith, *the United States Signal Service,* at the solicitation of *the Meteorological Council of Great Britain,* has accepted an invitation to lend assistance in this important movement to benefit the *commerce of the whole world,* and will collect meteorological information from ship-

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masters arriving in New York and Boston, and cable the same to the London Meteorological Office. From this point bulletins and warnings will be issued and telegraphed in times of great danger to all *European seaports.*

* * * * * *

I am, very respectfully, your obedient servant,

W. B. HAZEN,
*Brig. & Bvt. Major-General*
*Chief Signal Office U.S.A.*

In pursuance of the arrangements made with the Meteorological Office of London, England, there have been cabled to that office from New York twelve reports of storms encountered by vessels on the Atlantic, west of the forty-fifth meridian. Three messages were sent from Boston.

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We have also been favoured with the following letter from Mr. Harding, with reference to the remarks at the bottom of page 34 of this vol. of the Magazine. Mr. Harding also sent a reprint of the specification of his patent (1882, August 10, No. 3827), from which we extract a paragraph which shows how thoroughly he thought out the subject more than two years ago. It contains also appreciatory notices by Prof. Buys Ballot and others :—

*To the Editor of the Meteorological Magazine.*

SIR,—I thank you for a copy of your paper.

I have a patent for a vessel which could be used as a Floating Telegraph Ship for the Mid-Atlantic, to be moored in the usual track of the cyclones approaching these islands.

I used a vessel of the shape shown by the enclosed plan [almost exactly that of a magnifying glass,—ED.] for years for watching a large Fishery I hire in the Wash, covering a length of foreshore of upwards of 11 miles.

The vessel was used by water bailiffs to live on board and watch the beds, where no vessel riding to her anchor and swinging with each tide could possibly live. From the form of the bottom of this vessel the waves were deflected *under* her, and she rode like a basin on the water, and is capable of being moored with four anchors and cables, one to each point of the compass; by this means she can be moored in one fixed spot.

The vessel is now very old and rusted through, and lies on the shingle beach at Snettisham, Norfolk. She would ride out the heaviest gales with ease.

A vessel her shape, 500 to 1000 feet in diameter, would be capable of riding in the Mid-Atlantic in any weather, and being connected with the shore by an electric cable.

It is a matter which might pay an enormous profit, as in addition to being used by the Government for Meteorological purposes, it could be used as an ocean telegraph station, and also as a port of call.

It is a matter the Government ought to take up, or a public company.

No other vessel could be moored in *one* fixed spot without swinging, which would very shortly break the insulation of the electric cable.

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I place buoys every 50 or 100 fathoms along the four riding cables, so that there is no more pressure on the vessel from the enormous length of steel wire cable to say to 2000 fathoms depth than a vessel riding in a bay in 40 or 50 fathoms, as the cable is self-buoyant.

Yours truly,

C. W. HARDING.

*The Chase, King's Lynn, April 25th, 1885.*

The following paragraph occurs in the specification :—

"I claim as my invention * * * * Fifteenthly, the use of my vessel as a Telegraph Station, or ship, capable of being moored in deep water, and it could also be moored in the Mid-Atlantic, from which telegraphic messages could be transmitted to shore, giving forecasts of the weather and other matters of meteorological importance, connected with cyclonic and storm disturbances, for which purpose it could be placed in any part of the sea or ocean.

"When the vessel is placed, say in a thousand fathoms of water, I propose to use steel wire ropes as cables or hawsers for mooring, with rings spliced into the cable at convenient distances, and to each of these rings I attach a buoy or air tight vessel, having buoyancy to sustain a relative portion of the dead weight of the cable as shown in Fig. 5, and round one or more of such cables I wind an insulated wire for the transmission of telegraphic messages to the shore."

## ATLANTIC TIDES AS STORM WARNINGS.

*To the Editor of the Meteorological Magazine.*

SIR,—It is a well-known presage of storm, and oftentimes of general weather, especially on our Atlantic coasts, to note the action of the tides above or below the normal, on the approach of cyclones, or on the prevalence of certain constant winds.

In the extreme islands off the west coast of Scotland, this action has been for generations the never-failing barometer of the inhabitants, who are at once excellent and daring seamen, and well known, from their constant experience of storms, to be accurate forecasters of bad weather. With them the study is oftentimes one of life and death, and they rely in a marked manner on their observance of the tidal levels from day to day throughout winter. Amongst them it is a well-established fact that the waters of the Atlantic rise abnormally high for 48 hours and downwards, before the arrival of a cyclone, the height and time period varying with the force of the approaching disturbance. Indeed, so well is this axiom established, that according to the speed of the rise, or the attainment of high water before the normal time, or the retardation of low water under the same circumstances, they can determine whether the approaching disturbance is of a first or second class order, and frequently its direction, whether central or skirting their meridian. The most marked action is of course after a period of calm weather, but even in the midst of passing storms the maintenance of the tidal level at an abnormal height is a certain indication of continued gales, or shortly recurrent disturbances, and similarly the decadence of the tide levels is a sign of northerly or easterly winds of a constant nature, which in these districts is a sure indication of fair weather.

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Here, therefore, nature supplies us with an instrument of her own which, if properly studied in a few well chosen positions on the west coasts of Ireland and Scotland, will provide us with information which will go far to correspond with the results of an observer's station 1000 miles westward of our coasts.

If the daily records of the tides at these stations were faithfully recorded, and compared with the normal levels, and with periods of flow and ebb, as the rainfall is now so admirably collected by yourself, I venture to believe that very valuable data for forecasting would soon be established with greater certainty than by the barometrical gradient system now prevailing, and we should have the assistance of unerring data in determining results.

Of course where there are self-recording tidal gauges the work is more than half done already, and known data can be at once established for every month in the year.

Yours faithfully,

G. W. BRENAN, C.E.

*Oban.*

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## THE STAMFORD MERCURY.

*To the Editor of the Meteorological Magazine.*

SIR,—I shall be very grateful to any reader of *The Meteorological Magazine*, who can put us in the way of obtaining a record of meteorological observations taken in 1763, by the Rev. Caleb Parnham, rector of Ulford, near Stamford, in that year. The observations were recorded, I believe, in *The Lincoln, Rutland and Stamford Mercury* (commonly called *The Stamford Mercury*), in 1763, a file of which has not been kept in the office of that paper."—

Yours truly,

FRED. COVENTRY.

*Ketton, Stamford, May 8, 1885.*

[This is not the first time that inconvenience has arisen from the absence of a file of its own issues at the *Stamford Mercury* office. The journal is one of the oldest, if not the oldest in the British Isles having been published every week for 190 years! Possibly the proprietors *have* tried to escape from the unenviable if not unique position in which their predecessors have left them, but our impression is that their efforts towards obtaining a series of the early years have not been very heroic. There are, we believe, many years in the British Museum Library, but we do not know whether 1763 is among them. Some years back the sets of newspapers in the British Museum were very incomplete—it seemed as if they were regarded as useless lumber rather than as splendid materials for future history.—ED.]

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## ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

*To the Editor of the Meteorological Magazine.*

SIR,—Last Monday, April 20th, the air appeared to be unusually dry for this time of the year, and in order to test this the following observations were made. The temperature of the wet bulb has been given, but no use of it has been made in determining the relative humidity. During the time that the observations were taken (0.15 to 0.30 p.m.) there was no cloud, and the dry and wet bulb thermometers remained remarkably steady. The averages were 69°·2 for the dry bulb, 54°·9 for the wet. The dew point, taken at the same time by my hygrometer (with iced water and salt), was, on the contrary, most erratic, and its temperature varied with every puff of wind from 28° to 36°; this makes the relative humidity at the time to vary from 21 to 30 per cent. The air does not often attain to this degree of dryness; on the other hand it is not unprecedented. I find on referring to my journals that on July 1st, 1881, at 3.30 p.m., the dry bulb was 75°, the wet bulb 54°·2, while the dew point was only 21°; this shows the relative humidity to have been as low as 13 per cent. On this occasion the dew point was taken by means of ether, and I cannot place so much confidence in the result as if water had been used. Again, on March 29th, 1880, about 3 p.m., the means of 12 observations gave as follows:—dry bulb, 58°·7; wet bulb, 44°·7; the dew point, 13°·5; this makes the relative humidity 16 per cent. A difference of 25° between the temperature of the dry and wet bulbs has occasionally occurred in this country; this shows the air to have been very dry, but does not help us as far as relative humidity is concerned. The nearest approach to this difference of which I have any record, occurred on August 13th, 1876, at 3.40 p.m., when the dry bulb was 92°·6, the wet bulb 68°·4, the dew point taken at the same time by means of well water was 59°·5; this gives 34 as the relative humidity.

We have for many years past relied almost exclusively upon the indications of the dry and wet bulb thermometers to give us the relative humidity of the air, it is now admitted * that "all deductions from these are open to doubt." I should go further than this, and say that they ought not any longer to be used for that purpose. It is only too true to say, that out of the mass of observations which has been accumulating for the last few years, we have no data upon which we can rely, to ascertain to what degree of humidity the air attains in this country, and what is of far more importance, to compare the dryness of the air at one place with that at another; even at times when both thermometers read alike it does not follow that the air is saturated with vapour, or in other words, that its relative humidity is 100. Objections have been made to the form in which the

* See *Hints to Meteorological Observers*, page 11, prepared under the direction of the Council of the Royal Meteorological Society.

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figures composing a table of relative humidity are given, but this is as nothing when compared with the manner in which those figures are obtained.

I should be sorry to say one word against the use of the dry and wet bulb thermometers, but the four instances given above, and which might be supplemented by thousands, show plainly that they are not fitted to give the dew point temperature, and it is to the persistent use of them for this purpose, that Mason's Hygrometer, one of the most simple and useful of all meteorological instruments has been brought into discredit.

GEORGE DINES.

*Walton-on-Thames, April 24th, 1885.*

## RAINFALL AND PERCOLATION AT BEDFORD FOR THE PAST 18 MONTHS.

| | | Rain in inches. | Percolation. inches. | Loss inches. |
|---|---|---|---|---|
| 1883. | November | 2·17 | 1·10 | 1·07 |
| ,, | December | ·87 | ·80 | ·07 |
| 1884. | January | 1·70 | ·90 | ·80 |
| ,, | February | ·65 | ·50 | ·15 |
| ,, | March | ·91 | ·58 | ·33 |
| ,, | April | 1·26 | ·15 | 1·11 |
| ,, | May | ·70 | ·05 | ·65 |
| ,, | June | 1·81 | ·15 | 1·66 |
| ,, | July | 3·17 | ·70 | 2·47 |
| ,, | August | 1·25 | ·13 | 1·12 |
| ,, | September | 1·50 | ·65 | ·85 |
| ,, | October | 1·17 | ·42 | ·75 |
| ,, | November | 1·15 | ·55 | ·60 |
| ,, | December | 1·77 | 1·15 | ·62 |
| 1885. | January | 1·27 | ·80 | ·47 |
| ,, | February | 1·77 | 1·40 | ·37 |
| ,, | March | 1·17 | ·85 | ·32 |
| ,, | April | 2·23 | ·94 | 1·29 |
| | Total in 1½ yrs. | 26·52 | 11·82 | 14·70 |

The light rainfall during the past eighteen months is very notable, and shows a marked contrast when compared with the wet and cold cycle of preceding years. The average rainfall of the nine years preceding 1884 was 26·25 in., and the past eighteen months being 26·52 in., is only a fraction more. If it be true, as is generally accepted, that the extra rains carried down a good deal of fertilising matter from the soil, the land must now have recovered its normal condition. Doubtless the low temperature of these summers, which accompanies leaky skies, had impaired the farm crops, and to both causes the husbandman may, in a great measure, ascribe his serious pecuniary difficulties. The percolation as measured by a Dalton gauge, having two and a half feet of earth of a medium water-holding power, amounts to 11·82 inches, and the remainder 14·70 in. has passed upwards by evaporation.

DAVID ROBIE.

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## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly Meeting of this Society was held on Wednesday, April 15th, at the Institution of Civil Engineers, 25, Great George Street, Westminster, Mr. R. H. Scott, F.R.S., president, in the chair, when the following papers were read :—

(1) "Report of Committee on Decrease of Water Supply." This Committee was appointed to take into consideration the question of the decrease of water in springs, streams, and rivers, and also the simultaneous rise of the flood-level in cultivated countries. As far as any inference can be drawn from the records collected by the Committee it appears that the years 1820, 1821, 1824, 1835, 1838, 1845, 1847, 1850, 1854, 1855, 1858, 1859, 1864, 1865, 1871, 1874, 1875 and 1884 have been periods of marked low water. On the other hand, the years 1817, 1825, 1830, 1836, 1841, 1842, 1853, 1860, 1861, 1866, 1873, 1877, 1879, 1881 and 1883 have been periods when there has been exceptionally high water. In 1852 the water was very low in the early part of the year, while at the end of the year it was very high. In the intervening periods the water has been of moderate altitude. It does not appear from existing records that there is any diminution in the water supply of this country, and the large quantity of water which has been stored or has flowed off the ground between 1876 and 1884 is confirmatory of this view. There appear, however, to be periods when there is exceptionally low water, and these are almost immediately followed by periods of exceptionally high water. With reference to the increase of floods, it does not appear from the records that there is any great increase in the height to which the floods rise in this country. Whether or not the height to which floods have risen in recent years has been affected by river improvements and the greater facility with which floods can be got rid of, or whether there is a diminution in the quantity of water, are questions upon which the Committee have not at present sufficient information to speak positively.

(2.) "Report of Committee on the Occurrences of the Helm Wind of Cross Fell, Cumberland, from 1871 to 1884." In response to a letter inserted in the Penrith newspapers, the Committee has received a number of communications bearing on the subject of the Helm Wind. With the view of ascertaining as far as possible the meteorological conditions which exist when the Helm Wind is blowing, all the recorded occurrences that have been received have been chronologically arranged. The first systematic record commences in 1871, and in this Report the Committee deals with all occurrences from that date to the end of 1884. Since that time, at the instigation of the Royal Meteorological Society, more detailed records have been commenced at numerous stations in the locality. Ninety-three instances of the Helm Wind were recorded between 1871 and 1884; the months with the greatest frequency being February, March, April and November. On examining the Daily Weather Reports it was clearly seen that whenever the Helm Wind was blowing there was

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an Easterly wind, not only in the locality, but generally over the entire country. As the Helm Wind seemed to occur so regularly with the Easterly wind; the Committee further extended the inquiry with regard to the East wind. The Daily Weather Charts were consequently examined for each day from January 1st, 1871, to December 31st, 1884, and every occurrence of East wind was tabulated; the instances with general easterly conditions over the whole country being kept separate from those instances in which the Easterly wind was only partial, though of sufficient intensity to occasion the Helm wind. This examination showed that although the wind over the United Kingdom is generally Easterly when the Helm occurs, yet the Helm by no means occurs whenever the wind is Easterly. Indeed, this step in the inquiry has not at all tended to the elucidation of the phenomenon in question, for it frequently happens that the conditions are, to all appearances, precisely similar when the Helm is on, and yet no such occurrence has been recorded. This may in part be due to the occasional omission to record the Helm, although it cannot possibly be in the main attributable to such an omission; but it points to other conditions being necessary besides absolute agreement of wind direction and isobaric lines. Possibly the different hygrometric qualities of the air with the existing Easterly winds may be an important factor in deciding whether or no the Helm will be formed, but it is not readily conceived why even in this case the Helm wind should not blow. It must, however, be borne in mind that the surface winds only can be examined, whilst those at a comparatively small elevation may be intimately connected with the phenomenon. From the observations made prior to those started at the beginning of 1885, no idea can be formed of the behaviour of the upper currents even at the time of the occurrence of the Helm winds, far less with the occurrence of each East wind experienced. The Society has, however, provided for the extension of the inquiry in this direction in the records which are now being collected, the observers supplying observations of the upper currents by means of the clouds, as well as the direction of the winds at the surface of the earth. As soon as a sufficient number of these observations has been received the Committee hopes to present a further Report which will tend to explain the phenomenon of the Helm wind.

(3.) "Results of Meteorological Observations made at Asuncion, Paraguay," by R. Strachan, F.R.Met.Soc.

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COLLIERY EXPLOSIONS.—In a paper contributed to *La Houille* on explosions of firedamp and barometric falls, M. de J. Lebrun throws a doubt on their connection. He says that several English engineers and men of science have sought to establish a coincidence between great barometrical depressions and explosions of firedamp; but an inspection of the tables published by the French Commission on Firedamp does not appear to prove this. There are as many explosions at moments when the barometer does not vary, and when it rises, as there are when it falls.—*English Mechanic.*

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCT., 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | TotalRain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 63·9 | 16 | 32·2 | 29 | 57·1 | 41·9 | 43·3 | 79 | 104·7 | 25·6 | ·99 | 10 | 6·0 |
| Malta | 82·2 | 7 | 56·8 | 30 | 74·9 | 63·4 | 59·8 | 77 | 131·9 | 51·3 | 1·32 | 5 | 3·8 |
| *Mauritius* | 82·0 | 9 | 60·1 | 1 | 78·9 | 66·7 | 62·5 | 74 | 134·3 | 53·0 | 2·85 | 10 | 5·3 |
| Calcutta | 88·2 | 13 | 65·9 | 30 | 84·9 | 73·3 | 72·4 | 82 | 153·0 | 52·0 | 3·71 | 5 | 4·2 |
| Bombay | 90·4 | 19 | 70·8 | 17 | 86·7 | 74·6 | 72·3 | 76 | 149·9 | 60·4 | 2·22 | 8 | 3·1 |
| Ceylon, Colombo | 85·2 | 7 | 72·4 | 20 | 83·6 | 75·1 | 72·2 | 78 | 145·0 | 64·0 | 13·51 | 27 | 7·4 |
| *Melbourne* | 86·0 | 25 | 36·0 | 7 | 65·1 | 46·5 | 45·1 | 72 | 145·0 | 29·1 | 3·04 | 16 | 6·2 |
| *Adelaide* | 91·8 | 19 | 41·7 | 13 | 69·6 | 50·2 | 45·5 | 58 | 146·0 | 32·9 | 1·32 | 10 | 5·2 |
| *Wellington* | 66·5 | 24 | 36·5 | 16 | 59·6 | 46·4 | ... | ... | 140·0 | 34·0 | 7·33 | 12 | ... |
| *Auckland* | 68·0 | 27 | 43·0 | 15 | 63·1 | 50·5 | 47·2 | 70 | 143·0 | 36·0 | 2·86 | 21 | 6·0 |
| Jamaica, Kingston | 88·6 | 11* | 68·5 | 19 | 86·7 | 72·5 | 72·3 | 82 | ... | ... | 9·00 | ... | 7·2 |
| Barbados | 84·0 | var. | 70·0 | 22 | 82·0 | 72·0 | 75·9 | 84 | 146·0 | ... | 9·54 | 19 | 5·0 |
| Toronto | 81·5 | 4 | 24·3 | 24 | 56·8 | 39·7 | 44·0 | 77 | 135·4 | 18·0 | 1·50 | 14 | 5·8 |
| New Brunswick, Fredericton | 74·8 | 1 | 20·2 | 16 | 52·8 | 32·4 | 34·8 | 74 | ... | ... | 2·68 | 13 | 5·6 |
| Manitoba, Winnipeg | 74·1 | 15 | 4·3 | 31 | 49·2 | 29·2 | 33·4 | 76 | ... | ... | 1·51 | 10 | 6·2 |
| British Columbia, Victoria | 62·0 | 13 | 30·0 | 2 | ... | ... | ... | ... | ... | ... | 4·88 | 14 | ... |

* And 12.

### REMARKS, OCTOBER, 1884.

MALTA.—Mean temp., 68°·0; mean hourly velocity of wind, 7·8 miles; sea temp. fell from 77° to 72°; T and L on four days, L on six. J. SCOLES.

*Mauritius.*—Rainfall, 1·31 in., and temp. 0°·1 above average; mean hourly velocity of wind, 1·3 miles below average; extremes 30·4 miles on 12th, and 1·7 miles on 19th; T and L on two days, L on one. Sky glows occasionally. C. MELDRUM, F.R.S.

COLOMBO.—T on 16 days, L on 6. F. C. H. CLARKE, Major R.A.

*Melbourne.*—Mean temp. 2°·4, and temp. of dew point 1°·2 below average; rainfall, amount of cloud, humidity, and pressure all very near their respective averages. Prevailing winds S. and S.W., strong on six days; severe TS on 20th. R. L. J. ELLERY, F.R.S.

*Adelaide.*—One of the coldest Octobers recorded here, mean temp. 59°·9, 2°·1 below average; rainfall and pressure slightly below average; amount of cloud slightly in excess. On the evening of the 19th a very heavy dust storm was preceded and followed by an unusually brilliant display of L; scarcely any T was heard, and very little R fell. C. TODD.

*Wellington.*—Up to the 6th fine and pleasant; severe TS and heavy R on 7th, 1·50in. falling before 9·30 a.m., causing floods and damage; tolerably fine till 13th, then stormy till 15th, with T, H and R; showery and squally to 20th; from the 21st to the 28th generally fine, then showery to the end. R. B. GORE.

*Auckland.*—On the whole a cold, showery and windy month; mean temp., rainfall, and pressure all slightly below the average. T. F. CHEESEMAN.

KINGSTON.—Very heavy R 7th and 8th in the eastern part of the island, with loss of life and much damage from floods; the night of 7th and morning of 8th were stormy also in Kingston, 7 or 8 inches of R falling, with gusts from S.E. MAXWELL HALL.

BARBADOS.—Mean temp. (76°·4) 0°·6 below average; rainfall about the average; pressure fluctuating; mean hourly velocity of wind 5·1 miles, extremes 7·9 miles and 2·5 miles; 35 per cent below the average. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·37 | XI. | Rhayader, Nantgwillt.. | 3·54 |
| ,, | Margate, Birchington... | ·83 | ,, | Carno, Tybrith ... ..... | 1·72 |
| ,, | Littlehampton .. ..... | ·81 | ,, | Corwen, Rhug ..... | 2·43 |
| ,, | Hailsham ..... | .. | ,, | Port Madoc ..... | 2·20 |
| ,, | I. of W., St. Lawrence. | ·91 | ,, | I. of Man, Douglas ..... | 3·45 |
| ,, | Alton, Ashdell..... | 1·63 | XII. | Stoneykirk, Ardwell Ho. | 2·73 |
| III. | Winslow, Addington ... | 1·97 | ,, | Melrose, Abbey Gate... | 2·82 |
| ,, | Oxford, Magdalen Col... | 1·72 | XIII. | N. Esk Res. [Penicuick] | 2·00 |
| ,, | Northampton ..... | 2·05 | XIV. | Ayr, Cassillis House ... | 1·65 |
| ,, | Cambridge, Beech Ho... | 1·98 | ,, | Glasgow, Queen's Park. | 1·40 |
| ,, | Wisbech, Bank House.. | ·97 | XV. | Islay, Gruinart School.. | 2·15 |
| IV. | Southend ..... | ·71 | XVI. | St. Andrews, Newton Bk | 2·80 |
| ,, | Harlow, Sheering ... .. | 1·77 | ,, | Balquhidder, Stronvar.. | 4·92 |
| ,, | Rendlesham Hall ..... | 1·59 | ,, | Dunkeld, Inver Braan.. | 3·29 |
| ,, | Diss ..... | 1·44 | ,, | Dalnaspidal H.R.S. ... | 2·64 |
| ,, | Swaffham ..... | 1·50 | XVII. | Keith H.R.S. ..... ..... | 1·01 |
| V. | Salisbury, Alderbury... | 1·81 | ,, | Forres H.R.S. ..... ... | ·65 |
| ,, | Warminster ..... | 2·63 | XVIII. | Strome Ferry H.R.S.... | 1·89 |
| ,, | Calne, Compton Bassett | 1·92 | ,, | Lochbroom ..... ..... | ·83 |
| ,, | Ashburton, Holne Vic.. | 6·94 | ,, | Tain, Springfield..... | ·68 |
| ,, | Holsworthy, Clawton... | 3·15 | ,, | Loch Shiel, Glenaladale | 5·35 |
| ,, | Hatherleigh, Winsford. | 3·44 | ,, | Invergarry ..... | 2·77 |
| ,, | Lynmouth, Glenthorne. | 2·87 | XIX. | Lairg H.R.S. ..... | ·61 |
| ,, | Probus, Lamellyn ..... | 3·86 | ,, | Forsinard H.R.S. ..... | ·98 |
| ,, | Wincanton, Stowell Rec. | 3·21 | ,, | Watten H.R.S. ..... | ·95 |
| ,, | Wells, Westbury..... | 3·15 | XX. | Dunmanway, Coolkelure | 5·70 |
| VI. | Bristol, Clifton ..... .. | 2·18 | ,, | Fermoy, Gas Works ... | 3·62 |
| ,, | Ross ..... | ... | ,, | Tralee, Castlemorris ... | 2·98 |
| ,, | Wem, Sansaw Hall..... | 2·15 | ,, | Tipperary, Henry Street | 3·75 |
| ,, | Cheadle, The Heath Ho. | 1·85 | ,, | Newcastle West ..... | 1·54 |
| ,, | Worcester, Diglis Lock | 2·13 | ,, | Miltown Malbay..... | 2·46 |
| ,, | Coventry, Coundon ..... | 2·46 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 1·70 | XXI. | Carlow, Browne's Hill.. | 3·81 |
| ,, | Ketton Hall [Stamford] | 1·85 | ,, | Navan, Balrath ..... | 3·35 |
| ,, | Horncastle, Bucknall ... | 1·30 | ,, | Mullingar, Belvedere ... | 2·26 |
| ,, | Mansfield, St. John's St. | 1·88 | ,, | Athlone, Twyford ..... | 3·47 |
| VIII. | Macclesfield, The Park. | 1·63 | XXII. | Galway, Queen's Col.... | 2·60 |
| ,, | Walton-on-the-Hill..... | 1·61 | ,, | Clifden, Kylemore ..... | 5·38 |
| ,, | Lancaster, South Road. | 1·61 | ,, | Crossmolina, Enniscoe.. | 3·12 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 2·02 |
| IX. | Wakefield, Stanley Vic. | 1·53 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 1·82 | ,, | Rockcorry..... | 3·55 |
| ,, | Scarborough..... | 2·15 | ,, | Warrenpoint ..... | 4·35 |
| ,, | East Layton [Darlington] | 1·96 | ,, | Newtownards ..... | 2·53 |
| ,, | Middleton, Mickleton.. | 1·39 | ,, | Belfast, New Barnsley.. | 2·16 |
| X. | Haltwhistle, Unthank.. | 1·74 | ,, | Cushendun ..... | 2·71 |
| ,, | Shap, Copy Hill ..... | 3·70 | ,, | Bushmills ..... ..... | 2·26 |
| XI. | Llanfrechfa Grange . .... | 2·42 | ,, | Stewartstown ..... | 2·02 |
| ,, | Llandovery ..... | 2·65 | ,, | Buncrana ..... | 1·85 |
| ,, | Castle Malgwyn ..... | 4·07 | | | |

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# APRIL, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date | In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·32 | + ·30 | ·79 | 15 | 11 | 72·8 | 20 | 29·3 | 4 | 3 | 13 |
| II. | | Maidstone (Hunton Court)... | 2·17 | + ·32 | ·85 | 15 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 1·28 | — ·63 | ·34 | 5 | 12 | 72·9 | 19 | 23·9 | 4 | 5 | 9 |
| III. | | Hitchin ..... | 2·68 | + ·73 | ·69 | 15 | 15 | 70·0 | 20 | 23·0 | 3 | 8 | ... |
| ,, | | Banbury ..... | 2·21 | + ·20 | ·56 | 15 | 15 | 69·0 | 21 | 25·0 | 5 | 4 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·67 | — ·12 | ·39 | 9 | 15 | 73·0 | 22 | 22·0 | 2, 3 | 9 | ... |
| ,, | | Norwich (Cossey) ..... | 1·30 | — ·56 | ·36 | 8 | 13 | 74·0 | 22 | 24·0 | 5 | 7 | 7 |
| V. | | Weymouth(LangtonHerring) | 2·34 | ... | ·56 | 28 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple ..... | 2·44 | + ·06 | ·50 | 28 | 12 | 72·0 | 22 | 33·0 | 5 | ... | ... |
| ,, | | Bodmin ..... | 5·82 | + 2·49 | 1·06 | 24 | 16 | 65·0 | 20 | 31·0 | 4 | 1 | 15 |
| VI. | | Stroud (Upfield) ..... | 2·15 | — ·30 | ·75 | 1 | 16 | 70·0 | 21 | 30·0 | 2*e* | 4 | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·26 | + ·94 | ·75 | 25 | 14 | 68·0 | 19 | 27·5 | 5 | 7 | 10 |
| ,, | | Tenbury (Orleton) ..... | 2·48 | + ·31 | ·61 | 15 | 14 | 72·2 | 21 | 24·3 | 8 | 16 | 18 |
| VII. | | Leicester ..... | 2·24 | ... | ·48 | 1 | 15 | 71·5 | 19*a* | 25·5 | 5 | 3 | 17 |
| ,, | | Boston ..... | 1·27 | — ·62 | ·49 | 1 | 10 | 75·0 | 19 | 28·0 | 4 | 3 | ... |
| ,, | | Grimsby (Killingholme)..... | 1·82 | + ·06 | ·58 | 1 | 15 | 69·0 | 21 | 29·5 | 4 | 3 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·57 | ... | ·31 | 1, 6 | 14 | 71·0 | 19 | 23·0 | 4, 5 | 9 | ... |
| VIII. | | Manchester (Ardwick)..... | ·92 | — 1·11 | ·22 | 1 | 10 | 64·0 | 21*b* | 29·0 | 4 | 4 | ... |
| IX. | | Wetherby (Ribston Hall) ... | ·91 | — 1·60 | ·44 | 7 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 2·36 | — ·70 | ·40 | 20 | 14 | 69·0 | 18 | 25·0 | 2 | ... | ... |
| X. | | North Shields ..... | 1·56 | — ·44 | ·40 | 9 | 13 | 67·2 | 19 | 27·0 | 3 | 4 | 7 |
| ,, | | Borrowdale (Seathwaite)..... | 9·45 | + 4·51 | 2·44 | 24 | 11 | 64·2 | 17 | 28·9 | 3 | ... | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·60 | + ·26 | ·58 | 1 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·32 | + ·50 | 1·19 | 25 | 9 | 63·0 | 9 | 25·0 | 2 | 11 | 20 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 1·74 | ... | ·41 | 25 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·31 | — ·57 | ·27 | 6 | 12 | 61·2 | 19 | 32·0 | 3 | ... | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... ... | 3·57 | + 1·28 | 1·62 | 24 | 9 | 64·0 | 18 | 26·6 | 3 | 5 | ... |
| ,, | | Jedburgh (Sunnyside)..... | 2·13 | + ·43 | ·49 | 10 | 12 | 65·0 | 18*c* | 25·0 | 4 | 8 | ... |
| XIV. | | Douglas Castle (Newmains) | 2·23 | + ·35 | ·69 | 21 | 8 | ... | ... | ... | .. | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 2·51 | — ·12 | ·80 | 24 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 2·87 | ... | 1·06 | 20 | 12 | 58·5 | 17*i* | 33·0 | 16 | 0 | ... |
| ,, | | Mull (Quinish)..... | 2·28 | ... | ·62 | 24 | 11 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·30 | + ·09 | ·70 | 11 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 2·65 | + ·74 | ·83 | 24 | 11 | 62·0 | 19*d* | 31·0 | 2*f* | 6 | ... |
| XVII. | | Braemar ..... | 3·80 | + 1·72 | ·90 | 25 | 14 | 57·8 | 18 | 23·2 | 14 | 14 | 22 |
| ,, | | Aberdeen ..... ..... | 1·82 | ... | ·71 | 24 | 14 | 65·0 | 19 | 29·0 | 13*g* | 4 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XIX. | | Dunrobin ..... ..... | 1·25 | ... | ·41 | 24 | 7 | 61·5 | 18 | 30·0 | 14 | 6 | ... |
| ,, | | Orkney (Sandwick)..... .. | 1·43 | — ·44 | ·35 | 1 | 16 | 57·1 | 30 | 28·8 | 3 | 4 | 18 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 4·93 | + 1·83 | 1·26 | 5 | 15 | 75·0 | 18*c* | 28·0 | 2 | 5 | ... |
| ,, | | Dromore Castle ..... | 2·95 | ... | ·45 | 20*a* | 14 | 60·0 | 19 | 31·0 | 2 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·23 | ... | 1·53 | 21 | 12 | 64·0 | 18 | 28·0 | 3 | 5 | 19 |
| ,, | | Killaloe ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XXI. | | Portarlington ..... ..... | 2·82 | + ·79 | ·83 | 21 | 14 | 65·5 | 20 | 31·5 | 8 | 6 | ... |
| ,, | | Dublin (FitzWilliam Square) | 2·91 | + ·80 | ·62 | 21 | 16 | 66·1 | 19 | 32·2 | 3 | 2 | 9 |
| XXII. | | Ballinasloe ..... ..... | 2·35 | + ·09 | ·44 | 21 | 16 | 62·0 | 19 | 29·0 | 4, 9 | 11 | ... |
| XXIII | | Waringstown ..... | 2·13 | + ·24 | ·60 | 21 | 14 | 68·0 | 19 | 28·0 | 7*h* | 6 | 11 |
| ,, | | Londonderry (Creggan Res.). | 1·44 | ... | ·19 | 20 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

*a* And 21. *b* And 28. *c* And 19. *d* And 20. *e* And 3, 4. *f* And 17. *g* And 14, 16. *h* And 8, 14. *i* And 19.

+ Shows that the fall was above the average ; — that it was below it.

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# METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—A fine month with much cold wind, and low temp. at night, and all crops made great progress; profusion of blossom on all fruit trees. Peacock-butterfly flying on 14th; first swallow seen on 15th; cuckoo first heard on 16th, and nightingale and wryneck on the 20th. Blackthorn in flower on 5th.

HITCHEN.—The hottest April since 1870.

BANBURY.—Mean temp. 45°·4, about the average; H and R and S in very large flakes on 15th; dripping mist on 10th; H on 26th; high wind on 6 days; cuckoo heard on 26th, nightingale on 28th.

CULFORD.—The month commenced with cold and frosty nights, but the weather being dry no injury was done to fruit trees.

LANGTON HERRING.—On the whole a fine month; during the first half the temp. was much below the average, but a change took place on the 16th, and the temp. from that day was above the average; the mean for the whole month was about 1° below the average of 12 years. E. winds very prevalent; T and high wind on 25th; fog on two days.

BODMIN.—The largest rainfall recorded in April for many years, being 2·80 in. above the average of 36 years; mean temp. 47°·3.

STROUD.—Cold winds and a backward spring. S.W. gale on the 25th.

WOLSTASTON.—There were sharp frosts at night during the early part of the month, and S fell heavily on the 15 and 16th; severe gales occurred on 5th and 24th. Mean temp. 44°·6; cuckoo first heard on 22nd; swallows seen on 20th.

ORLETON.—The weather was uniformly cold with a prevalence of cloudy days and frosty nights till the 17th, when a great rise of temp. took place, and it continued warmer till the end of the month. The mean temp. was more than 2° below the average of 24 years, but the max. was above 70° on three days. The weather was favourable for all farming operations, and for vegetation which was kept back. Pressure was generally low and unsteady, but the fluctuations were not great. Very strong wind on 25th, and a few trees blown down; cuckoo heard on 19th; many swallows seen on 21st.

LEICESTER.—The early part of the month was dull and cold; N. and N.E. winds prevailed until the 19th, when a change to S.W. occurred, after which the air was more genial and warm. R needed at the close of the month.

MANCHESTER.—A dry month, although the rainfall was about one-third greater than in April last year, and one-fourth greater than in April, 1883. There were several frosty nights at the beginning of the month, which retarded vegetation, and did no damage; the min. temp. rose as the month advanced, and the weather became quite genial, and vegetation made great progress.

SEATHWAITE.—Dry at the beginning of the month, and cold during the first half; very wet from 20th to 25th, 7·87 in. falling in the six days.

## WALES.

HAVERFORDWEST.—R fell in large quantity on the morning of the 1st, followed by sharp frost till the 5th, when it blew a fresh gale with heavy R; broken, cold weather followed till 8th, from which date to the 15th it was keenly cold; from 17th to 20th very fine, warm, summerlike days occurred, after which the temp. decreased again, and it was stormy and wet from 25th to 27th, it was then cold to the end. A severe month, all fodder used up and no grass. Blackthorn blossomed on the 15th; cuckoo heard on the 25th.

## SCOTLAND.

CARGEN.—Mean. temp. 1°·4 below the average. The first half of the month was unusually cold, northerly and easterly winds prevailing. Vegetation was very backward, a few beech trees only breaking into leaf towards the end of the month. 3·25 in. of the total R fell between the 20th and 25th.

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JEDBURGH.—Remarkably dry weather with cold N.E. and E. winds until about the 19th; vegetation up to that date was very backward, and grass fields very brown. 1½ in. of S on 2nd; much T on 25th.

BRAEMAR.—The month, although cold, was favourable for seed sowing, but growth was much retarded.

ABERDEEN.—The weather was very seasonable for the agriculturist. Rainfall about half an inch below the average.

SANDWICK.—On the 2nd very severe H showers occurred, several panes of glass being broken in windows. The showers were worst in the early morning, from 4 a.m. to about 7 a.m.; one H stone was found to weigh 26 grains, and when melted measured 20 minims. Hoy hill white on 1st.

## IRELAND.

BLACKROCK.—The max. temp. of the 18th and 19th was the highest recorded in April during the last 10 years.

DROMORE.—The first part of the month was rather hard with E. wind, and very little vegetation. Towards the end of the month heavy falls of R occurred at night, but the days were fine with showers and sunshine, and vegetation made great progress.

WATERFORD.—All the early part of the month E. and N.E. winds prevailed. Rainfall about 1·50 in. above the average of 25 years. Swallows seen on 16th; cuckoo heard on 25th; H on the 1st; trees very late in coming into leaf.

DUBLIN.—Until the 17th the weather was cold and dry with searching "polar" winds, but on that date the long-delayed spring may be said to have arrived with the setting in of equatorial winds. A burst of summerlike warmth on the 18th and 19th was followed by copious rains, soft winds and occasional hot sunshine by day, and rather low temp. by night. The mean temp. (45°.6) was 1°·4 below the average. Sleet fell on the 1st and 5th; H on the 9th and 16th; fog on five days. Mean humidity, 80; mean amount of cloud, 5·6; prevailing winds E., S.S.E., and S.W.

BALLINASLOE.—The first part of the month was generally fine, but with strong harsh winds, principally from E. and N.E.; the latter portion was wet, the harsh winds continuing.

WARINGSTOWN.—A most favourable month for farming operations, but grass at least three weeks later than usual, and all spring growth unusually backward, foliage being often as forward in the first week of April, as it was this year at its close.

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## FROST OF 1739-40.

*To the Editor of the Meteorological Magazine.*

SIR,—The following extract from Harrod's "Antiquities of Stamford," may, perhaps, be of interest to the readers of your Magazine:—

"In the hard frost in 1740, at two different days, a sheep and a hog were roasted on the river Welland, where the ford is at the opening in Water-street. The printers also came and got much money by printing persons' names who assembled there. The hard frost began on Christmas eve in 1739, and lasted till Lady-Day, 1740; the greatest degree of cold was on January 5th in the morning; it frequently relented in the forenoon, but was sure to return at night; however, it was not so intense as the frost in 1709, when the Adriatic Sea was so frozen that it might be passed on foot, so that had the Venetians been at war with the Turks their city might have been taken by a land army. . . . . "—Yours truly,

FRED. COVENTRY.

*Ketton Hall, Stamford, May 11th, 1885.*

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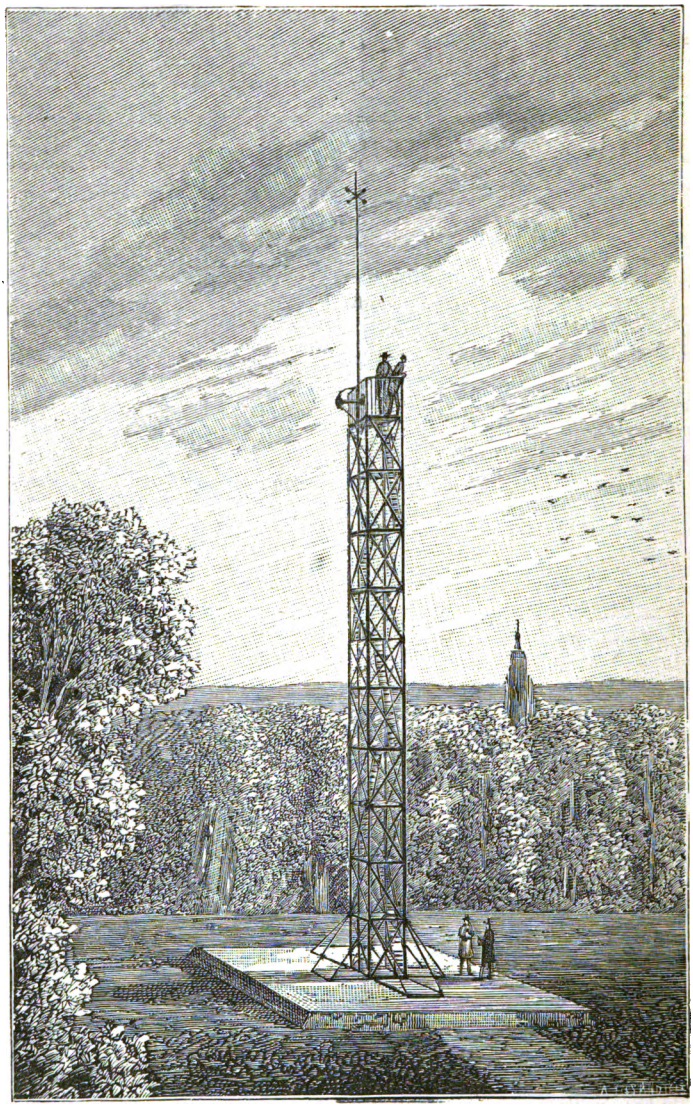

ANEMOMETER &c., TOWER AT M. HERVÉ-MANGON'S OBSERVATORY, BRÉCOURT SAINTE-MARIE-DU-MONT, MANCHE, FRANCE.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXIII.] JUNE, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## M. HERVÉ-MANGON'S IRON TOWER.

AFTER a life-long devotion to the application of Science to Agriculture, after years spent in the study of the influence upon land of irrigation and drainage, in which the Meteorological, the Engineering, the Chemical, and the Agricultural aspects were considered with equal care, we rejoice to see the Past President of the *Société Météorologique de France*, the Chairman of the French Meteorological Council put in what every one must admit to be his proper place, viz., that of (what we so much need in England) Minister for Agriculture.

But M. Hervé-Mangon is not one to let his duties as a statesman obliterate his love for Science; and we are glad not merely to lay before our readers the representation and description of one of his latest efforts on behalf of Meteorology, but also to add that at no remote period we have reason to hope for a useful contribution to Meteorological literature.

At present we have to deal solely with the Iron Tower, for the engraving of which we are indebted to the inventor's kindness.

And first, let us consider the need of such an edifice. Probably no one ever climbed a lofty tower without experiencing, on reaching the summit, a sensation of lightness and freshness, although few have taken the trouble to think out the causes of that sensation. The chief cause is undoubtedly the increased velocity of the air. It needs no scientific skill to perceive that the fluid ocean in which we live, must be retarded by friction, even where it passes over (say) a cornfield; while those who are familiar with what is known as skin-resistance will realize that even over a calm sea the retardation of the lower strata of an air current is decidedly important. When we pass to land, with hills, and trees, and houses, the resistance becomes very great, and the opportunities for obtaining strictly comparable records of the velocity of the wind become very rare. Here meteorologists come in and hitherto with the result of making matters worse instead of better, for with an utter disregard of common sense, they have hardly ever mounted two anemometers alike, either as regards the height above the ground at, or the shape of the edifice upon, which they are supported. We do not here go into the



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subject, but append in a foot-note some references which anyone who thinks our remarks too severe had, before replying to them, better consult.*

M. Hervé-Mangon, being an engineer as well as a scientific man, has so designed his tower as to attain several separate objects. It is made almost wholly of angle-iron bolted together, and therefore all, except the base, is easily moved: in proof of which it may be mentioned that the tower represented in the engraving, which is 50 feet high, was made in the suburbs of Paris, sent to M. Hervé-Mangon's country seat, and erected, without any scaffolding or hoists, in three days by three men.

Angle-iron is used as giving the maximum of strength combined with a large surface, the object being to ensure that thermometric observations shall not be vitiated by the influence of the temperature of the mass of the tower. It is painted white, and it is found that even in full sunshine the iron is not 1° F. hotter than the surrounding air.

The provision of internal ladders is extremely convenient, and infinitely to be preferred to the "bear's pole" up which (some twenty years since) we used to climb morning and night in order to obtain a set of thermometric readings 20 feet above the soil, and clear of the influence of buildings. Far safer, too, than for example, the rain gauge masts at Calne, Castleton Moor, and Strathfield Turgiss, the anemometer mast at the Montsouris Observatory, or others, from some one of which a fatal accident is certain to occur.

This first tower is only 50ft. high, but it will be evident from the drawing that it is merely a question of heavier iron and therefore rather greater cost, to double or quadruple that height. The foundation is very simple—an excavation of two feet, with the first three feet of the tower set in a large square bed of concrete three feet thick.

The anemometer is a Robinson cup with M. Hervé-Mangon's arrangement for electrically recording its indications, which bye-the-bye it does in the laboratory 150 yards distant.

The mast slides in a tube by the side of the tower, and although this mast is nearly 50ft. long and weighs six cwt., it is so arranged that one person can, by means of a windlass at the top of the tower, easily raise or lower it in a few minutes.

When meteorologists arouse themselves to the fact that there are matters of more importance than determining the mean pressure at Shanghai true to 0·001 in., when they get out of the ruts into which so many of them drive, we shall see the great question of local

*(1) Stevenson—Journal Scot. Met. Soc. Vol. V., p. 348.
(2) Reports of Court of Inquiry.....fall of Tay Bridge. London, 1880.
(3) Bender, Gaudard, Symons, Baker, Seyrig, Rogers Field and others, Min. Inst. Civil Engineers, Vol. LXIX., 1882.
(4) Archibald—*Nature*, Nov. 20, 1884, and Rep. Brit. Ass. Montreal, 1884, p. 639.

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influence investigated; we or our successors shall see towers like this rendered useful alike to meteorology and to hygiene, by the determination of the influence of the earth's surface not merely on wind force, or on temperature, but upon the humidity and purity of the air by researches on the hygrometry and by analysis of the air at various heights, for both of which purposes this tower would be as perfectly suitable as it is for the subjects for which it was specially designed.

## Dr. Borius.

WE learn with great regret that Dr. Borius, several of whose works upon the climate of Senegal, and also upon that of Brest, have been brought before our readers, has at last fallen a victim to the climate of Tonkin. On the outbreak of hostilities he was selected by the French Government for service with the expedition, because of his medical and meteorological knowledge, and because his previous experience on the West Coast of Africa would, of course, be most useful. He was provided, by the Bureau Central Météorologique, with a complete set of instruments, and for a considerable period sent home very valuable records, but at last his useful career is over; he has fallen, like so many others, at the post of duty. Can one wish for more?

## ROYAL METEOROLOGICAL SOCIETY.

The usual monthly meeting of this Society was held on Wednesday evening, the 20th inst., Mr. R. H. Scott, F.R.S., President, in the chair. Dr. H. Dobell, and Mr. J. N. Longden were elected Fellows of the Society.

The following papers were read:—1, "The Temperature Zones of the Earth considered in relation to the duration of the hot, temperate and cold periods, and to the effect of temperature upon the organic world," by Dr. W. Koppen, Hon.Mem.R.Met.Soc. 2, "Velocities of Winds and their Measurement," by Lieut.-Col. H. S. Knight, F.R.Met.Soc. The author, after describing the various ways of ascertaining the direction and velocity of the wind, makes several suggestions for the improvement of Robinson's anemometer. 3, "On the Equivalent of Beaufort's Scale in Absolute Velocity of Wind," by Dr. W. Koppen, Hon.Mem.R.Met.Soc. The author refers to Mr. C. Harding's paper read before the Society in December last on the anomalies in the various wind velocities given by different authors as equivalents for the numbers in Beaufort's scale; and, as illustrating the point, calls special attention to the want of agreement between the velocities obtained by Mr. Scott and those subsequently obtained by Dr. Sprung, and confirmed by himself. 4, "Note on a Peculiar Form of Auroral Cloud seen in Northamptonshire, March 1st, 1885," by the Rev. James Davis.



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## ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Dines, in the April number of the *Meteorological Magazine* maintains that all deductions from the psychrometer are open to doubt, and I affirm that so also are all deductions from condensing hygrometers, and that the former is a more simple and manageable instrument than are any of the latter. Psychrometers are comparable with each other, hygrometers are not, or there would not be so many varieties of them. For my part, I prefer the deductions from psychrometers to those from hygrometers. A condensing hygrometer, whether Daniell's, Regnault's, Dines's, or Alluard's, has the thermometer's bulb immersed in a cooling medium, and one surface of the dew plate is also in contact with the cooling medium, but the surface upon which the dew is formed is cooled by conduction, and is exposed to the air which may be many degrees, 50 or 60, or more, warmer. In these circumstances, when dew appears, the thermometer must be colder than the outside of the plate. When the dew disappears, the thermometer cannot have received the same addition of heat as the outer surface of the plate. These are the results of conduction, and in Dines' hygrometer the plate is glass, a bad conducting substance.

Mr. Dines states that on April 20th, while the psychrometer "remained remarkably steady," his hygrometer was "most erratic." Why? Great differences between the observed and computed dew-points occur with great dryness of the air. There is then great cold around the thermometer's bulb, while the outside of the plate where the dew is looked for, is exposed to great heat, and this is especially the case if the observer is short-sighted, and has to approach close to the instrument. The plate does not in fact cool so low as the thermometer, which accordingly gives a temperature much lower than the dew-point. The hygrometer never can give the correct dew-point when the air is very dry. Even supposing Mr. Dines' observations to be correct, before they can be used to test the formula for the psychrometer, the atmospheric pressure must be given. If the psychrometer is not fitted to give the dew-point temperature, and the relative humidity, for what is it fitted?—Yours faithfully,

R. STRACHAN.

*11, Offord Road, N., May 25th, 1885.*

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[We strongly object to the name psychrometer, Ψυχρός Μέτρον, cold measurer), being given to the dry and wet bulb or to any hygrometer; but in the above letter we think that its use secures brevity and prevents confusion. The dry and wet bulb thermometer ought to be called Boeckmann's Hygrometer, but not one person in a thousand would recognise it under that name.—ED.]

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## THE FROZEN GROUND AT YAKOUTSK.*

Among the "Scraps" on page 26 will be found some remarks upon the above subject. We have since been favoured with the following letter from the highest authority upon underground temperature, Prof. Everett, F.R.S., the Secretary of the Committee of the British Association studying that subject, and editor of its sixteen consecutive reports :—

SIR,—I have looked up the reference in my reports respecting the Yakoutsk Well, referred to at page 26 of your March number.

General Helmersen is responsible for the calculation (see my fourth report, A), and he is probably right. You will notice that there is an extraordinary difference between the temperature at 100 feet deep and the mean temp. of Yakoutsk. Helmersen founds his calculation on the former, you found yours on the latter; hence the discrepancy in your results.

Leaving the air temp. out of the question, the data seem to stand thus :—

| | | | | |
|---|---|---|---|---|
| 100 ft. | ..... | —5·2 R. | ..... | = 20·3 F. |
| 540 ft. | ..... | —1·4 | ..... | = 28·8 |

Whence is computed—

| | | | | |
|---|---|---|---|---|
| 706 ft. | .. ... | 0·0 | ..... | = 32·0 |

The gradient being 1°R in 117 ft., or 1°F in 52 ft.—Yours truly,

J. D. EVERETT.

*Lennoxvale. Belfast, April 5th, 1885.*

In order to put our readers in possession of all the details known to us or referred to in the British Association Report, we add the following paragraphs :—

A.—EXCERPT from General Helmersen's letter to Prof. Everett in 4th Report of Committee on Underground Temperature :—

"You are doubtless aware of the existence of a series of observations on the temperature of the soil at the bottom of a well which was sunk in the town of Yakoutsk in Eastern Siberia. This well has shown us that the soil of Siberia, at least in this part of its great extent, is frozen to a depth of 540 English feet. The mean temperature of Yakoutsk is −8°·2 R. = 13°·6 F. At the depth of 100 feet the temperature of the soil was found to be—5°·2 R. = 20°·3 F. From

* We ought perhaps to apologise for the spelling here adopted, but the precise representation of the Russian name is not easy, as there are many ways of spelling it. We arrange a few in the alphabetical order, with the authority for each .—

IAKOUTSK.—Atlas of Useful Knowledge Society.
IAKUTSK.—Dr. Wild of St. Petersburgh.
IAKUTZK.—Prof. Dove.
JAKOUZK.—Dr. Erman.
JAKUTZK.—Prof. Dove.
JAKUZK.—Berghaus.
YAKOUTSK.—General Helmersen, of St. Petersburgh, and Keith Johnston.
YAKUTSK.—Blackie, Dr. Hann, and Keith Johnston.

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this depth to the bottom the temperature increased at the rate of 1° R for every 117 feet, = 1° F in 52 feet; whence it would follow that the soil at Yakoutsk is frozen to the depth of about 700 feet."

EXCERPT from the Fourth Report of Committee on Underground Temperature.

An account of the Yakoutsk well is given in "Comptes Rendus," tome vi., 1838 (B), in an extract from a letter by Erman (fils), who visited Yakoutsk when the well had attained a depth of 50 feet. He gives the temperature at this depth from his own observations, and the temperatures at 77, 119, and 382 feet from the subsequent observations of the merchant to whom the well belonged. His figures differ very materially from those given above; but it may fairly be presumed that General Helmersen's account is the more accurate.

B.—COMPTE RENDU DES SEANCES DE L'ACADEMIE DES SCIENCES, 16th Avril, 1838, p. 501.—*Extract from a letter from* M. ERMAN *fils to* M. ARAGO, *respecting the temperature of the earth in* SIBERIA.

ABSTRACT.

IN my Journal I have epitomized the details of the climate of Yakoustk. A merchant there, M. Schergin, had, in the hope of reaching water, caused a well to be sunk, which at the time of my visit was 50 English feet deep, but I found the temperature constantly − 6° R [ = 18°·5 F.], therefore the temperature of the air there cannot be greater, though the latitude is only 62°. Moreover, this agrees closely with the air temperatures as recorded by thermometers which I have myself verified. Hence it follows that water can only be reached when the natural rise of temperature amounts to 6° R [ = 13½° F.]; this according to observations in other parts of Europe, and to my own in the Ural mountains, is 1° R for 90 or 100 French feet [ = 1° F. in 42 to 47 ft.]. I should, therefore, not expect to reach 32° at Yakoustk at less than 500 to 600 French feet [533 to 640 English feet].

The observations made by M. Schergin since my visit, and during the digging of the well to 400 English feet, have thoroughly confirmed my previous remarks, having given—

| | | | |
|---|---|---|---|
| 77 | English feet | − 5°·5 R. | = 19°·6 F. |
| 119 | ,, ,, | − 4 ·0 | = 23 ·0 |
| 382 | ,, ,, | − 0 ·5 | = 30 ·9 |

But they indicate a rise of 1° R for 60 English feet [ = 1° F for 26 English feet !] which is much more rapid than usual.

SUMMARY OF THE FACTS.

| | | |
|---|---|---|
| Mean temp. of air at Yakoutsk | ... | 13°·6 F. |
| Temp. according to Erman at 50 ft. | ... | 18 ·5 |
| ,, ,, ,, Schergin at 77 ft. | ... | 19 ·6 |
| ,, ,, ,, Helmersen at 100 ft. | ... | 20 ·3 |
| ,, ,, ,, Schergin at 119 ft. | ... | 23 ·0 |
| ,, ,, ,, ,, at 382 ft. | ... | 30 ·9 |
| ,, ,, ,, Everett at 540 ft. | ... | 28 ·8 |

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From this it is evident that 32° is likely to be reached at some depth not exceeding 700 or 800 ft., but it would be very interesting to have the *details* upon which General Helmersen based his statement that "From this depth (100 ft.) to the bottom (540 ft.) the temperature increased at the rate of 1° F. in 52 ft."

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We regret to see that the death of General Helmersen is just announced.

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## FROST OF 1739–40.

*To the Editor of the Meteorological Magazine.*

SIR,—With reference to Mr. Coventry's letter, I shall be very much obliged to any reader of the *Meteorological Magazine* who will inform me if any records of *thermometrical observations* taken during this frost exist; and, if so, by whom? and where were they kept?

I am Sir, yours truly,

G. T. GWILLIAM.

*Bayswater, May 22nd.*

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[We have not time to make a careful search, but suggest that Mr. Gwilliam should look in the *Philosophical Transactions* for observations made at Oundle, Northamptonshire, by Mr. Lynne, and at Lyndon, Rutland, by Mr. Barker. We reprint for general use parts of the remarks upon December, 1739, and January, 1740, given by Dr. Huxham*, which will indicate the severity of the frost even at so comparatively mild a place as Plymouth.

DECEMBER.

Full Moon the 4th. New Moon the 19th.

The Weather in this Month was altogether surprising; In the Beginning of it we had a north-east Wind and a severe Frost, presently a rainy and turbulent south Wind; in a very short Time after a south-westerly, and a great deal of Rain, the Barometer nevertheless rising. The 14th and 15th the Wind was north-west; the 16th, north-east, and a Return of the Frost; the 19th and 20th, a violent south-east; on the 21st, again, a stormy south-west; from that an easterly to the 28th, a cold north-east Wind intervening, the 25th and 27th; then a most severe Storm from the East, with an exceeding severe Frost, and a constant exceeding small Snow to the very End. In an Instant a most piercing Cold froze up every Thing, both within Doors and without; nay, the very strongest Kinds of Wine were frozen; indeed whatever was exposed to the air instantly turned into Ice. People even shivered by the largest Fire's-Side, nor could keep themselves warm in their very Beds; indeed so very greatly were we benumbed by the excessive Cold, that we seemed scarcely alive. A most violent storm at the Close of *December* carried off a great Number of Birds, both small and great, from the Land, and drove them to a vast Distance from Shore, which, being quite tired with their long Flight, betook themselves to those Ships which were in the Midst of the Ocean, and were easily taken by the Sailors: "Mirum utiquè Genus aucupii?"—Nay, in the Beginning of the *January* following, I myself accidentally going on Board his Majesty's Ship,

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* Observations on the air and epidemic diseases from . . 1738 to . . 1748 by J. Huxham, M.D., F.R.S. Vol. ii. 8vo. London. 1767.

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the *Weymouth* to see the Earl of *Deloraine*, who then lay sick, saw a Pie made of small birds, which the Sailors in their Return from *Lisbon* to our Port, had taken far, and far enough, from any Land.

Dig. Dec.
Rain 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 20. 21. 22. 23. 24. = 4·102.

Much Rain the 21st, 22d, and 23d, altho' the Barometer was at 30·1; besides we had a very violent south-west Wind; but the Air itself was exceeding thick and moist, an immense Quantity of Vapours being dispersed all over the Atmosphere. I was incapable of exactly estimating the Quantity of Snow which fell, being by the Impetuosity of the Wind blown out of the Receiver.

| | | | |
|---|---|---|---|
| Greatest Height of ☿ ..... | 16, | 30·2, N.E. 1. | Mean Height |
| Least ——— ..... | 4, | 29·1. S.S.W. 3x. | 29·8. |
| Coldest Day in the Memory of Man,... | 31, | 90, E.N.E. 4x. | Mean Height |
| Warmest——— ... | 10, | 52, S.W. b W. 3x. | 61 $\frac{6}{28}$ |

Some miliary and nervous Fevers, the Small-pox here and there, Quinsies and Opthalmies Common; Coughs, Rheumatisms, Pleurisies, and Peripneumonies, frequent.

## JANUARY.

Full Moon the 2d. New Moon the 17th.

The Severity of the Cold still continued, such, indeed, as was never known in this Country. Altho' on 1st Day of the Month there was a very great thaw, and a Fall of Rain, nevertheless the north-easterly Wind and a most sharp Frost instantly returned, which lasted to the very End of the Month; and altho', by the Heat of the Sun, all things were thawed by Day, yet by Night they were bound up by a most rigid Frost. The Atmosphere was generally very thick, and appeared as if covered over with Smoak; but, between the 10th and 17th, exceeding thin. The coldest Days were the 11th, 15th, 16th, 17th, 18th, 26th, 27th, 28th; nay, so severe was the Frost which now prevailed, that all Kinds of Wine, being exposed out of Doors, were immediately turned into Ice; nay, the very Salt-water upon the Shores was so, a Thing this which very seldom happens in these Parts. Innumberable Trees and Shrubs were cut off by the Cold, and even the very hardy Furzes themselves; indeed, you could scarce see a green Herb. A vast Number of Sea Birds flew hither, and Numbers from Foreign Countries, which had hever been seen here before.

Dig. Dec.
Rain 1. 2. 9. ——— Snow and Hail 8. 9. =0·416.

I could not perceive any northern Lights all this Month, altho' the Wind was constantly northerly.

| | | | |
|---|---|---|---|
| Greatest Height of ☿ | 14, | 30·4, E.N.E. 2. | Mean Height |
| Least ——— | 1, | 29·1, S.W. 2. | 30·1 $\frac{14}{31}$ |
| Coldest Day..... | 26, | 84, N.N.E. 1 | Mean Height |
| Warmest — ..... | 31, | 69, S.E. b E. 3x. | 75 $\frac{11}{31}$ |

Some explanation of the above temperatures is needed, as otherwise the entry of "90°, Coldest Day in the Memory of Man," would be puzzling. Dr. Huxham states that he used a thermometer graduated according to "Hauksbee's construction, fixed in a proper room," and on another page he says that his observations are comparable with the well-known series made in Edinburgh, 1731-35, where the thermometer was in a perforated box outside a north window. We think that Hauksbee's scale was that called by Martine the "Royal Society" scale; if so, Dr. Huxham's thermometer was a very bad copy. His max. temperature on a very warm day in July 1738

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was 17, and 17° Royal Society is supposed to equal 82° Fahrenheit which would do very well; but he makes the mean temp. of Plymouth about 45 Royal Society, = 59° F., which is far too high. And lastly, his "Coldest Day in the Memory of Man," with 90° Royal Society, would give about 23° F, which is nothing like cold enough to correspond with his description of the effects. In fact it is perfectly evident that M. Wargentin was quite right when he wrote* respecting Hauksbee's thermometers, "Ces thermomètres ne valent absolument rien."]

## ON THE MEASUREMENT OF THE ALTITUDE AND MOVEMENT OF CLOUDS.†

For the Swedish Arctic Expedition some special theodolites were constructed designed for the rapid determination of the position of prominent auroral phenomena. These instruments would evidently answer equally well for determining the position of clouds. The Academy of Sciences of Stockholm caused others to be made and placed, two of them at the disposal of the authors; also two telephones and the needful wire; the instruments were erected, one at the Observatory at Upsala, and the other about a quarter of a mile away. The observers being able to converse readily, the observations had a great advantage over all previous attempts. The present paper is rather descriptive of the instruments and of the modes of calculating than of the phenomena observed, but the facts seem to be extremely interesting and instructive. The base of a quarter of a mile proved too short, having regard to the altitudes to be measured, and this year they hope to resume their measurements with a longer one.

## ON THE CLIMATE OF THE GOLD COAST.‡

Not long since we were indebted to the Basel Missionaries for an extremely important and useful map of the portion of Africa in which they are working. In the little work now before us Dr. Riggenbach does several useful things: he epitomizes the meteorological work done on the Gold Coast, he gives us the results of observations made by Dr. Mähly, during his journey to, and also at, the Mission stations in the interior, he gives first attempts at diagrams of the daily curve of temperature, and of the barometric fluctuation from hourly observations between 9 a.m. and 10 p.m., discusses at some length the nature of the Harmattan, &c. In a historical intro-

* *Mém de l'Acad. de Suéde.* Tome xi. p. 178.

† *Mesures des Hauteurs et des Mouvements des Nuages*, par N. Ekholm e K. L. Hagström. Nova Acta Reg. Soc. Sc. Upsal. Upsal, Berling, 1885.

‡ Zum Klima der Goldküste; Von A. Riggenbach. Aus den Verhandlungen der Naturforschenden Gesellschaft in Basel. VII. Theil, 3 Heft. Basel: J. G. Baur, 1885.

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duction Dr. Riggenbach gives a very useful list of observers and authors who have contributed to our knowledge of the district—a list which appears to us perfect, and which starts with Isert, in 1783, and ends with Mähly, in 1884.

The observations are terribly fragmentary, but Dr. Riggenbach recognizes the fact, and has shown thorough skill in turning them to the best account.

We cannot pretend to epitomize the whole paper, but we jot down some facts.

The highest temperatures seem to be at Christiansborg, which is almost at the level of the sea. The daily temperature curve for that station reaches its max. at 1 p.m., while at the inland stations, such as Abetifi (lat. 6°50′ N., lon. 0°43′ W., altitude 2,198 feet), it does not reach it till 2.30 p.m., and on fine days not till 3 p.m.

The following are approximate mean annual values :—

| | Latitude. | Long. | Altitude. | Temp. | Rain. |
|---|---|---|---|---|---|
| | ° ′ | ° ′ | ft. | ° | in. |
| Christiansborg..... | 5 32 N. | 0 10 W. | 49 | 80·5 | 22·64 |
| Elmina .. . ..... ..... | 5 3 | 1 20 | ... | 79·3 | 30·79 |
| Aburi ..... | 5 51 | 0 9 | 1542 | 73·4 | 41·68 |
| Odumase ..... | 6 8 | 0 0 | 361 | 77·0 | ... |
| Abetifi ..... ... | 6 50 | 0 43 | 2198 | 72·0 ? | 42·00? |

## THE "STAMFORD MERCURY."

*To the Editor of the Meteorological Magazine.*

SIR,—I learn that Mr. Parnham took meteorological observations daily while at Ufford, 1738—1764 (died 1764) and that a digest of them was published "in one of our newspapers of last year" as Jones writes in the summer of 1764. It is either this digest, or the newspaper of 1763 containing it, that I am anxious to see. I find that there are files of the *Stamford Mercury* at the Stamford Institution as far back as 1799, and at the British Museum, I am informed, as far back only as 1826. The first *Stamford Mercury* was printed by Thompson & Bailey, in St. Martin's, Stamford, about 1712. The first newspaper published in England, was dated July, 23, 1588; it was designed by the Lord Treasurer Burghley, to answer the same purpose as the present *London Gazette*.—I am, Sir, yours faithfully,

FRED. COVENTRY.

*Ketton Hall, Stamford, June 2nd, 1885.*

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1884

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | TotalRain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 60·2 | 7 | 25·3 | 25 | 48·8 | 37·3 | 38·4 | 85 | 64·6 | 21·4 | 1·92 | 12 | 6·7 |
| Malta | 71·6 | 5 | 49·2 | 22 | 66·5 | 56·8 | 51·9 | 75 | 118·2 | 44·0 | 5·24 | 12 | 4·8 |
| *Mauritius* | 83·6 | 21 | 63·7 | 23 | 80·4 | 68·8 | 64·0 | 73 | 134·7 | 54·4 | 2·21 | 9 | 4·7 |
| Calcutta | 85·3 | 2 | 54·8 | 29 | 79·7 | 62·1 | 60·2 | 73 | 144·7 | 39·9 | 0·01 | 1 | 2·4 |
| Bombay | 88·7 | 6 | 66·6 | 19 | 86·3 | 71·4 | 66·8 | 67 | 144·7 | 53·3 | 0·60 | 1 | 1·6 |
| Ceylon, Colombo | 87·2 | 20* | 71·0 | 25+ | 85·2 | 73·2 | 70·3 | 74 | 145·0 | 59·0 | 17·73 | 14 | 6·0 |
| *Melbourne* | 92·9 | 20 | 41·7 | 9 | 70·0 | 51·0 | 48·6 | 68 | 151·5 | 32·7 | 3·11 | 12 | 6·3 |
| *Adelaide* | 94·0 | 20 | 46·0 | 30 | 76·9 | 55·2 | 46·3 | 48 | 155·0 | 32·2 | 0·37 | 8 | 4·3 |
| *Wellington* | 67·3 | 3 | 40·8 | 7 | 60·5 | 47·7 | ... | ... | 143·0 | 35·0 | 4·28 | 13 | ... |
| *Auckland* | 70·5 | 22 | 45·0 | 11‡ | 64·8 | 51·5 | 48·4 | 71 | 139·0 | 40·0 | 2·08 | 13 | 6·9 |
| Jamaica, Kingston | 90·1 | 4 | 67·6 | 17 | 87·9 | 71·2 | 71·1 | 81 | ... | 63·0 | 1·46 | ... | 4·8 |
| Barbados | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Toronto | 54·1 | 10 | 10·7 | 27 | 40·5 | 27·3 | 29·8 | 81 | 106·2 | 4·5 | 2·31 | 13 | 7·1 |
| New Brunswick, Fredericton | 50·3 | 5 | 8·7 | 19 | 39·4 | 23·3 | 26·0 | 79 | ... | ... | 4·40 | 14 | 6·5 |
| Manitoba, Winnipeg | 49·2 | 13 | -25·1 | 23 | 26·0 | 9·6 | 19·6 | 86 | ... | ... | 0·83 | 8 | 6·5 |
| British Columbia, Victoria | 58·0 | 7 | 27·0 | 22 | ... | ... | ... | ... | ... | ... | 1·60 | 11 | ... |

* And 22. + And 27. ‡ And 12.

### Remarks, November, 1884.

Malta.—Mean temp., 60°·6; mean hourly velocity of wind, 9·3 miles; TSS on three days, H on 1. J. Scoles.

*Mauritius.*—Rainfall ·82 in. above, and temp. 0°·6 below average; mean hourly velocity of wind, 0·6 mile below average; extremes 27·9 miles on 7th, and 2·1 miles on 14th, prevailing direction S.E. by E., to E. by N. L on 6th. C. Meldrum, F.R.S.

Ceylon.—TSS on 4 days, T on 1, L on 3. F. C. H. Clarke, Major, R.A.

*Melbourne.*—Mean. temp., 0°·7 below average, rainfall ·67 in., and temp. of dew point, humidity, amount of cloud, and pressure slightly above their respective averages. Prevailing winds S. and S.W., strong on 8 days; TS on 6th; L on 12th; lunar halos on 2 days. R. L. J. Ellery, F.R.S.

*Adelaide.*—As a whole, fine and pleasant, rainfall only about one-third of the average; mean temp. slightly below, and pressure considerably above the average; amount of cloud less than usual; TSS on 2 days. C. Todd.

*Wellington.*—Fine till 4th, when a N.W. gale blew at night, followed by showery, unpleasant weather till 12th (2·33 in. of R on 7th); from 12th to 21st, finer weather, though unsettled and changeable; remainder of the month generally showery and squally; prevailing wind, N.W.; mean temp (54°·1), 2°·7 below average; rainfall slightly below, and pressure slightly above average. R. B. Gore.

*Auckland.*—A cold, though fine month; rainfall considerably below, and pressure slightly above their respective averages. T. F. Cheeseman.

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# SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ... | XI. | Rhayader, Nantgwillt.. | 4·51 |
| ,, | Margate, Birchington... | 1·90 | ,, | Carno, Tybrith ... ..... | 3·73 |
| ,, | Littlehampton .. ..... | 2·74 | ,, | Corwen, Rhug ..... | 2·20 |
| ,, | Hailsham ..... | 2·97 | ,, | Port Madoc ..... | 2·09 |
| ,, | I. of W., St. Lawrence. | 2·33 | ,, | I. of Man, Douglas ..... | 2·18 |
| ,, | Alton, Ashdell..... | 4·92 | XII. | Stoneykirk, Ardwell Ho. | 2·10 |
| III. | Winslow, Addington ... | 2·87 | ,, | Melrose, Abbey Gate... | 3·72 |
| ,, | Oxford, Magdalen Col... | 2·03 | XIII. | N. Esk Res. [Penicuick] | 2·65 |
| ,, | Northampton ..... | 2·44 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | 3·23 | ,, | Glasgow, Queen's Park. | 2·84 |
| ,, | Wisbech, Bank House.. | 2·35 | XV. | Islay, Gruinart School.. | 2·81 |
| IV. | Southend ..... | .. | XVI. | St. Andrews, Newton Bk | 3·57 |
| ,, | Harlow, Sheering ... .. | 3·61 | ,, | Balquhidder, Stronvar.. | 3·90 |
| ,, | Rendlesham Hall ..... | 2·91 | ,, | Dunkeld, Inver Braan.. | 5·05 |
| ,, | Diss ..... | 3·10 | ,, | Dalnaspidal H.R.S. ... | 5·28 |
| ,, | Swaffham ..... | 2·76 | XVII. | Keith H.R.S. ..... ..... | 3·57 |
| V. | Salisbury, Alderbury... | 3·21 | ,, | Forres H.R.S. ..... ... | 1·62 |
| ,, | Warminster ..... | 3·33 | XVIII. | Strome Ferry H.R.S.... | 4·26 |
| ,, | Calne, Compton Bassett | 2·47 | ,, | Lochbroom ..... | 3·69 |
| ,, | Ashburton, Holne Vic.. | 4·08 | ,, | Tain, Springfield..... | 2·43 |
| ,, | Holsworthy, Clawton... | 2·42 | ,, | Loch Shiel, Glenaladale | 5·93 |
| ,, | Hatherleigh, Winsford. | 3·27 | ,, | Invergarry ..... | 3·39 |
| ,, | Lynmouth, Glenthorne. | 3·08 | XIX. | Lairg H.R.S. ..... | 4·75 |
| ,, | Probus, Lamellyn ..... | 3·18 | ,, | Forsinard H.R.S. ..... | 3·41 |
| ,, | Wincanton, Stowell Rec. | 3·09 | ,, | Watten H.R.S. ..... | 1·83 |
| ,, | Wells, Westbury..... | 2·97 | XX. | Dunmanway, Coolkelure | 3·66 |
| VI. | Bristol, Clifton ..... .. | 3·26 | ,, | Fermoy, Gas Works ... | 3·13 |
| ,, | Ross ..... | 2·00 | ,, | Tralee, Castlemorris ... | 2·99 |
| ,, | Wem, Sansaw Hall..... | 2·28 | ,, | Tipperary, Henry Street | 2·49 |
| ,, | Cheadle, The Heath Ho. | 2·02 | ,, | Newcastle West ..... | 2·39 |
| ,, | Worcester, Diglis Lock | 2·70 | ,, | Miltown Malbay..... | 2·31 |
| ,, | Coventry, Coundon ..... | 2·40 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 1·83 | XXI. | Carlow, Browne's Hill.. | 2·39 |
| ,, | Ketton Hall [Stamford] | 2·16 | ,, | Navan, Balrath ..... | 1·84 |
| ,, | Horncastle, Bucknall... | 1·49 | ,, | Mullingar, Belvedere ... | 1·67 |
| ,, | Mansfield, St. John's St. | 1·98 | ,, | Athlone, Twyford ..... | 2·26 |
| VIII. | Macclesfield, The Park. | 1·94 | XXII. | Galway, Quen 's Col.... | 2·10 |
| ,, | Walton-on-the-Hill..... | 1·57 | ,, | Clifden, Kylemore ..... | 5·20 |
| ,, | Lancaster, South Road. | 2·52 | ,, | Crossmolina, Enniscoe.. | 3·65 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 2·33 |
| IX. | Wakefield, Stanley Vic. | 1·45 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·74 | ,, | Rockcorry..... | ... |
| ,, | Scarborough..... | 1·93 | ,, | Warrenpoint ..... | 1·57 |
| ,, | East Layton [Darlington] | 3·56 | ,, | Newtownards ..... | 1·65 |
| ,, | Middleton, Mickleton .. | 4·07 | ,, | Belfast, New Barnsley.. | 2·88 |
| X. | Haltwhistle, Unthank.. | 2·45 | ,, | Cushendun ..... | 2·03 |
| ,, | Shap, Copy Hill ..... | 3·10 | ,, | Bushmills ..... ..... | 2·27 |
| XI. | Llanfrechfa Grange . ... | 3·71 | ,, | Stewartstown ..... | 1·94 |
| ,, | Llandovery ..... | 3·16 | ,, | Buncrana ..... | 2·62 |
| ,, | Castle Malgwyn ..... | 2·39 | | | |

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# MAY, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·63 | + ·71 | ·39 | 21 | 19 | 73·8 | 28 | 31·1 | 8 | 1 | 7 |
| II. | | Maidstone (Hunton Court)... | 3·36 | + 1·34 | ·55 | 28 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 2·45 | + ·77 | ·55 | 21 | 18 | 68·3 | 28 | 30·2 | 12 | 2 | 7 |
| III. | | Hitchin ..... | 2·51 | + ·52 | ·61 | 21 | 16 | 68·0 | 28 | 31·0 | 7*a* | 2 | .. |
| ,, | | Banbury ..... | 2·48 | + ·35 | ·54 | 25 | 17 | 70·5 | 27 | 29·5 | 8 | 3 | .. |
| IV. | | Bury St. Edmunds (Culford) | 3·17 | + 1·27 | ·43 | 25 | 21 | 79·0 | 28 | 30·0 | 7*b* | 6 | .. |
| ,, | | Norwich (Cossey) ..... | 3·15 | + 1·34 | ·48 | 28 | 19 | 77·0 | 28 | 28·2 | 15 | 5 | 7 |
| V. | | Weymouth(LangtonHerring) | 2·73 | ... | ·85 | 21 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 3·21 | + 1·11 | ·67 | 19 | 17 | 69·0 | 28 | 41·0 | 7*c* | ... | .. |
| ,, | | Bodmin ..... | 3·17 | + ·33 | ·76 | 21 | 25 | 65·0 | 31 | 36·0 | 7*d* | 0 | 7 |
| VI. | | Stroud (Upfield) ..... | 2·56 | + ·26 | ·51 | 21 | 23 | 75·0 | 28 | 32·0 | 7 | 1 | .. |
| ,, | | ChurchStretton(Woolstaston) | 2·39 | ·00 | ·25 | 9*e* | 22 | 65·0 | 27 | 33·0 | 7, 8 | 0 | 6 |
| ,, | | Tenbury (Orleton) ..... | 3·40 | + ·97 | ·58 | 5 | 24 | 66·8 | 28 | 28·6 | 8 | 5 | 9 |
| VII. | | Leicester ..... | 2·49 | ... | ·55 | 21 | 20 | 71·7 | 28 | 31·7 | 8 | 2 | 2 |
| ,, | | Boston ..... | 1·67 | — ·10 | ·32 | 5 | 19 | 73·0 | 28 | 32·0 | 8 | 1 | .. |
| ,, | | Grimsby (Killingholme)..... | 1·93 | + ·28 | ·29 | 1 | 22 | 72·0 | 28 | 32·0 | 8 | 0 | .. |
| ,, | | Hesley Hall [Tickhill]..... | 1·67 | ... | ·30 | 3 | 18 | 75·0 | 28 | 29·0 | 12 | 4 | .. |
| VIII. | | Manchester (Ardwick)..... | 1·68 | — ·55 | ·24 | 23 | 19 | 69·0 | 27*f* | 35·0 | 8 | 0 | .. |
| IX. | | Wetherby (Ribston Hall) ... | 3·09 | + 1·27 | ·49 | 22 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 3·89 | + ·77 | ·63 | 3 | 22 | ... | ... | ... | ... | ... | ... |
| X. | | North Shields ..... | 2·75 | + ·90 | ·37 | 20 | 22 | 71·0 | 28 | 29·5 | 7 | 5 | .. |
| ,, | | Borrowdale (Seathwaite)..... | 6·30 | — ·68 | 1·15 | 20 | 23 | 60·1 | 28 | 28·5 | 7 | ... | .. |
| XI. | WALES. | Cardiff (Ely)..... | 3·77 | + 1·17 | ·85 | 19 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·41 | + ·72 | ·70 | 20 | 16 | 64·0 | 26*g* | 28·5 | 11 | 4 | 8 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 2·82 | ... | ·40 | 1 | 19 | ... | ... | ... | ... | ... | .. |
| ,, | | Llandudno..... | 1·08 | — ·54 | ·26 | 10 | 11 | 64·5 | 26 | 36·8 | 7 | 0 | .. |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·06 | — ·47 | ·38 | 20 | 15 | 60·4 | 28 | 30·0 | 8*d* | 4 | .. |
| ,, | | Jedburgh (Sunnyside)..... | 2·58 | + ·79 | ·53 | 1 | 15 | 64·0 | 26 | 28·0 | 12 | 6 | .. |
| XIV. | | Douglas Castle (Newmains) | 2·82 | + ·48 | ·71 | 1 | 16 | ... | ... | ... | .. | ... | .. |
| XV. | | Lochgilphead (Kilmory)..... | 3·11 | + ·35 | ·42 | 27 | 21 | ... | ... | ... | ... | ... | .. |
| ,, | | Oban (Craigvarren) ..... | 2·39 | ... | ·35 | 21 | 17 | 60·7 | 26 | 31·0 | 7 | 2 | .. |
| ,, | | Mull (Quinish)..... | 2·91 | ... | ·43 | 27 | 19 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 3·90 | + 1·61 | ·80 | 21 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 2·98 | + 1·21 | ·58 | 20 | 17 | 63·0 | 29 | 32·0 | 12 | 1 | .. |
| XVII. | | Braemar ..... | 4·62 | + 2·20 | ·69 | 20 | 28 | 59·8 | 28 | 27·3 | 12 | 10 | 14 |
| ,, | | Aberdeen ..... | 3·84 | ... | ·86 | 9 | 23 | 62·0 | 28 | 30·0 | 12 | 3 | .. |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 2·96 | + 1·18 | ... | ... | ... | 64·0 | 28 | 31·0 | 6*d* | 2 | 18 |
| XIX. | | Dunrobin ..... | 3·47 | ... | ·59 | 20 | 22 | 60·0 | 28 | 30·0 | 12 | 2 | .. |
| ,, | | Orkney (Sandwick)..... | 1·70 | — ·17 | ·36 | 8 | 22 | 60·5 | 28 | 32·5 | 7, 9 | 0 | 8 |
| XX. | IRELAND. | Cork (Blackrock) ..... | 3·29 | + 1·13 | ·59 | 19 | 22 | 69·0 | 12 | 31·0 | 7 | 2 | .. |
| ,, | | Dromore Castle ..... | 4·33 | ... | ·50 | 2*f* | 19 | 60·0 | 31 | 31·0 | 13 | ... | .. |
| ,, | | Waterford (Brook Lodge) ... | 2·85 | ... | ·63 | 19 | 24 | 63·0 | 31 | 31·0 | 8 | 1 | 19 |
| ,, | | Killaloe ..... | ... | .. | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XXI. | | Portarlington ..... | 2·04 | + ·19 | ·46 | 20 | 24 | 61·5 | 26 | 31·0 | 6 | ... | .. |
| ,, | | Dublin (FitzWilliam Square) | 2·53 | + ·81 | ·49 | 19 | 23 | 64·5 | 28 | 32·7 | 7 | 0 | 6 |
| XXII. | | Ballinasloe ..... | 2·09 | — ·32 | ·35 | 19 | 24 | 65·0 | 31 | 29·0 | 7 | 4 | .. |
| XXIII | | Waringstown ..... | 1·65 | — ·46 | ·37 | 23 | 16 | 66·0 | 25 | 29·0 | 6, 7 | 3 | 6 |
| ,, | | Londonderry (Creggan Res.). | 3·24 | ... | ·37 | 8 | 26 | ... | ... | ... | ... | ... | ... |
| . | | Omagh (Edenfel) ..... | 2·39 | + ·04 | ·32 | 23 | 25 | 65·0 | 16*h* | 28·0 | 7 | 6 | .. |

*a* And 11. *b* And 11, 12, 13, 14. *c* And 19. *d* And 12. *e* And 25. *f* And 28. *g* And 31. *h* And 27.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON MAY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—An unsettled month, with low temp. Cold winds and storms, and frosts at night prevailed until the last few days; altogether the coldest May remembered. Growth of all kinds checked, keep for stock very scarce, and everything remarkably backward. TS on 3rd and 17th, with H on the latter day. First swift seen on 1st; first pheasant hatched on 9th; young frogs seen on 15th; corn-crake heard on 25th; orange tip butterfly flying on 26th, and large white butterfly on 28th; wild strawberry in flower on 2nd, lilac on 6th, mountain ash on 10th, horse-chestnut on 13th, may on 14th, laburnum on 17th, oak in leaf on 10th.

BANBURY.—Mean temp. 48°·3, 4° 0 belowthe average. Upon the whole a favorable month and not much damage done by frost. Hawthorn abundantly blossoming at the end of the month, but petals much touched by frost in low situations near water, and having a singularly shabby appearance. Slight S on 7th and 8th, T and L on 3rd, T on four other days, H on one day.

CULFORD.—The month was generally stormy, and the nights were as a rule cold. H with distant T occurred several times.

LANGTON HERRING.—A cold ungenial month. Mean temp. 2°·6 below the average of 13 years; and max temp. the lowest in May during 14 years, with the exception of 1877. The highest min. also was low, and from the 1st to the 25th, the temperature fell every night to or below 45°. Dense fogs occurred on the 25th and 26th, and foggy weather was experienced on the following four days; T on 3 days, and solar halos on 3 days.

BODMIN.—A cold ungenial month. Mean temp. 52°·0.

STROUD.—A cold month, and a very backward season, T and L on 10th and 13th. H storms on 22nd.

WOOLSTASTON.—A cold month: mean temp. 47°·0. Apple trees show an unusual amount of blossom, giving promise of a magnificent crop. T on 3rd and 14th.

ORLETON.—A very cold and stormy month with frequent falls of R; till the 24th the weather was very cold, the max. temp. never rising to 60°·0; the remainder of the month was warmer, but not equal to the average; the mean temp. for the whole month was more than 4°·0 below the average of 24 years, and about 0°·6 below that of 1879. Pressure was lower than usual, but the fluctuations were not great. There was much blossom on all fruit trees, but later than usual. Distant T was heard on the 3rd. A fall of S covering the ground occurred on the night of the 5th.

BOSTON.—The weather was very changeable, the range of temp. being 41°·0. There were some days with fine weather, sunshine and mild temp., and others bitterly cold, with H and S; T and L also occurred. The generally ungenial weather with low temp., R and frosts, coming after the fine weather at the end of April, was anything but beneficial to vegetation, and wheat, especially on poor and heavy lands began to turn yellow and look sickly; the warmer weather and showers at the end of the month did much to revive vegetation generally.

KILLINGHOLME.—A fine month, but with many frosty nights; crops of all kinds giving good promise. T on 16th, 21st, and 29th.

MANCHESTER.—The month was cold for the season; although the temp. here did not fall below 35°, there were hard frosts in the country around this city; there were a few genial days in the last week, when the temp. rose to 69°.

NORTH SHIELDS.—TSS on 8th, 21st, 22nd and 25th and T on 16th and 29th. S and H on 7th and 10th.

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## WALES.

HAVERFORDWEST.—The month commenced wet and unsettled; and was very bleak and cold with sharp night frosts up to the 18th; the last week was much warmer and more genial. TSS on 3rd and 9th. Oak in leaf on 20th, ash only commencing to unfold, white-thorn in blossom on 30th. A great promise of hay. Sharp TS on 3rd; TS on 9th.

LLANDUDNO.—A dry bright month with ample sunshine (183 hours); but mean temp. no less than 4°·0 below the average, owing in a measure possibly to the unusual number of icebergs in the Atlantic. The daily and total range of temp. were considerably below the average, and there was no frost.

## SCOTLAND.

CARGEN.—The coldest May experienced since observations were commenced 25 years ago; mean temp. 46°·0, 4°·9 below the average; the lowest means for the month previously observed are 48°·9 in 1866, 46°·8 in 1869, and 48°·9 in 1883. Vegetation in a very backward state, few oaks being in leaf and still fewer ashes; the oak and ash have not before been observed coming into leaf so nearly at the same time, the oak, in this district, being generally speaking about ten days or a fortnight before the ash. T on six days, L on one, S and H on one.

JEDBURGH.—The weather was cold and ungenial, and though the rainfall exceeded the average for the month, the frequent cold winds soon dried it up, and little or no interruption was caused to country work except for a few days at the beginning of the month. Fruit blossom was abundant and as it escaped the frost, a good crop is hoped for. S on 5th, H on 6th, 9th and 10th. T on 7th, 10th, 15th and 16th. L on 10th and 16th.

OBAN.—A decidedly cold May, with a preponderance of N. winds, and a frequency of light rains. Vegetation very backward, owing to the cold, and green crops scarcely through the ground. On the 22nd and 27th, there were notable examples of white cloud fog which came up from the Atlantic and remained hanging over the sea for many hours, that of the 22nd being dispelled by northerly winds, that of the 27th being driven and succeeded by a strong gale from the S.W. T and L on 19th.

QUINISH.—A very cold, backward month from first to last.

BRAEMAR.—More or less S fell on nine days.

ABERDEEN.—The weather throughout the month was very wet and unsettled, the rainfall being two inches above the average; a severe S storm occurred in the early morning of the 10th; H on four days.

CULLODEN.—The early part of the month was cold, and there were late frosts; pastures made little, and in many places no advance; during the last week the weather was more genial.

## IRELAND.

DROMORE.—The month was very cold with plenty of R; not much vegetation.

WATERFORD.—The month was cold and ungenial, the late frosts nipping early potatoes, but fruit blossom was most profuse. T and H showers occurred on several days, and on 21st a house was struck, and a tree split by L; on 8th heavy H fell, some of the stones being $\frac{3}{4}$ in. long, and $\frac{1}{2}$ in. across. S.W. gale on 28th and 29th.

DUBLIN.—For the most part a cold, showery month. Up to the 24th there was a remarkable and persistent deficit of temp. associated with a prevalence of polar winds, chiefly from N.W., and frequent H showers. The coldness of the weather was probably due to the melting of S and ice in Russia and the Baltic on the one hand, and on the other to the presence of vast ice-fields in the Atlantic as far south as Lat. 44°, and as far east as Long. 46°. The distribution of cold and warmth during the month was similar to that observed in April—first came a long cold period, and then a sudden change to warmer

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weather; but in May the max. temp. in shade (64°·3) fell short of the max, in April (66°·1) by 1°·6. At 2 p.m. on 17th, an exceptionally violent downpour of H occurred. TSS with H on 2nd, severe H storms on 10th, and L in the evening; fog on 20th. The mean temp. (47°·4) was 3°·5 below the average, the month being colder than any previous May for at least 20 years, the mean temp. of May 1869 (47°·5), and that of May, 1879 (47°·6) being the nearest. Mean humidity 76; mean amount of cloud 5·7; prevailing winds W., N.W. and S.W.

WARINGSTOWN—The latest spring remembered; foliage not much more forward at the close of the month than it usually is at the commencement.

EDENFEL.—The weather of the month, except a few days at the beginning and end, was cold, wintry and wet. S on 6th, and H and sleet almost daily from thence to the 23d.

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## ATLANTIC TIDES AS STORM WARNINGS.

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to Mr. Brenan's letter in your last number, permit me to remark that it appears to me that the Hebrideans, for lack of a mercurial barometer, have been in the habit of using an aqueous one to enable them to forecast cyclonic disturbances.

If from any cause the atmospheric pressure be lightened over a limited area of any body of water, the surrounding heavier air will force the water to rise in the limited area, just as it does in a common pump when the piston lifts up the pressing atmosphere inside the pump barrel. Within the cyclonic circuit the atmospheric pressure is less than outside, consequently the sea-surface embraced by the cyclone will rise in proportion to the difference of pressures; and so therefore as the cyclonic disturbance of balance travels eastward, overshadowing the Western Isles, so certainly will the sea-surface rise above the normal. The Islesmen of the past, not being in possession of artificial barometers, have ingeniously made use of the only substitute available—a natural one.

The moral of the matter is this. Instead of longer waiting for records of tides, let the Islesmen of Scotland and Ireland get, or be furnished with, good barometers, which will inform them quite as well as the sea-level regarding the diminution of atmosperic pressure.

As I have the pen in hand, excuse my adverting to what seems to me an unfortunate perversion of phrases. It is well known that within the area of a cyclone the air ascends, and, rising higher than the surrounding regions, flows over into them. Yet ever and anon we are told that an area of *depression* is travelling over certain districts. It may be explained that a depression of the mercury in the barometer is what is meant. But that is never said, and to most people the expression will convey the impression that it is the air that is alluded to; as they observe the air travelling, whilst the barometer continues to hang on its peg.

HENRY MUIRHEAD.

*Cambuslang, May 18th, 1885.*

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SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

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## SCINTILLATION AND WEATHER FORECASTING.

"Twinkle, twinkle little star,
How I wonder what you are,
Up above the world so high,
Like a diamond in the sky."

WE are not prepared to show that the above quotation contains any indication of the author's scientific knowledge, but we could not bring ourselves to entitle this paper "Twinkling and Weather Forecasting," or else something besides the stars would have twinkled; on the other hand, the title we have chosen might *per se* have frightened away some whom we wish to read the following pages. Hence it was that we brought the above quotation to our rescue.

One other prefatory remark, viz., that the following pages are suggested by, founded upon, and condensed from, papers in the Belgian Meteorological Journal, *Ciel et Terre* (which we have often commended to our readers), and especially from the article "*La Scintillation des étoiles dans ses rapports avec les phénomènes météorologiques*" in which M. Montigny has been so kind and beneficent as to epitomise the result of his work upon the subject during the last quarter of a century.

In the first place we may mention that the twinkling of the stars (it will be remembered that the planets do not twinkle) has been skipped by a host of writers upon astronomy. It is useless to give a list of the works which omit all reference to it, and we therefore reproduce merely the short chapter in which Arago epitomizes his (we believe the first) thorough discussion of the subject.

### ON SCINTILLATION.*

In the case of a person observing the stars with the naked eye, scintillation consists in rapid variations of brightness. These variations are often accompanied with changes of colour, and with alterations in the apparent diameters of the stars, or in the lengths of the diverging rays, which appear to dart from their centres in different directions. Scintillation in telescopes is accompanied with peculiar features. This phenomenon arises from the peculiar properties possessed by the constituent rays of light, of moving with different

* Popular Astronomy—Smyth and Grant's translation, Vol. I. (1855), p. 135.



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velocities through the strata of the atmosphere, and of producing what is called interferences. We have devoted an entire Notice to the explanation of this curious fact, which has occupied the attention of the greater number of astronomers. It would be too long for insertion here; and we think it useless to analyse its contents. It will suffice to state that the rapid changes of brightness and colour which the stars exhibit, are connected in the present day with the known laws of physics, and especially with those of luminous interferences. The more or less vague explanations of scintillation given by different astronomers are inadmissible; they do not show why the planets, for example, do not scintillate; why certain stars scintillate less than others; why the purity of the sky and the low temperature of the nights add to the beauty of the phenomenon.

The first to make systematic observations on the amount of scintillation was Professor C. Dufour of Morges, on the Lake of Geneva; he was followed very shortly afterwards by M. Montigny, of Brussels, and we think that it is within the mark to say that they two have done more towards elucidating the subject than all the rest of the world before or since. The former is quoted in the *Royal Society Catalogue* as the author of three papers on the subject, and the latter as author of eight, prior to 1873 when the last catalogue closes.

Professor Dufour began by trying several forms of scintillometer (twinkle measurer) which had been suggested by Arago and by others, but as he was not satisfied with any of them, he started a system of record with the naked eye, on an estimated scale with 0 for no scintillation, and 10 for the maximum. During about three years 1853–6 he did not lose a single evening when the stars were visible, and thus he amassed more than 13,000 records. The discussion of these observations led to the following conclusions:

(1) Red stars scintillate less than white ones.

(2) Except close to the horizon; the scintillation is proportional to the product of the thickness of atmosphere traversed by the ray of light, multiplied into the astronomical refraction due to the altitude of the star.

(3) Besides the variation due to colour, there are differences which seem to be due to some property of the stars themselves.

Professor Dufour pointed out that the second conclusion justified the formation of a table whereby the scintillation of any star at any altitude might be converted into the equivalent for any uniform altitude, such as for example, that of 60° of zenith distance.

M. Montigny at an early date designed an apparatus which brings the rapid twinkling within the scope of easy and accurate measurement. We must refer our readers for the full description and necessary engravings to some of M. Montigny's earlier papers in *Ciel et Terre*—confining ourselves to some stray remarks which even

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if not strictly accurate may still afford hints respecting the method. Cost is often a great obstacle to scientific progress, and therefore, heretical though it may be, we take it up first. M. Montigny tells us nothing about it. He says that he uses a 3 inch achromatic—and that is at any rate not a very serious item—it is perhaps not very far from the sized telescope most usually possessed by meteorological observers. His scintillometer, unless we mistake, can easily be so constructed as to become virtually merely an extra eye piece (just like a position micrometer) to such a telescope.* And when the workmen get used to making them we think that from £3 to £5 would probably cover the cost. As to the general principle of the instrument, we are irreverent enough to say that it is a combination of the whirling of a burning stick with that of the trick of rendering a coin visible by pouring water into the basin containing it—the image of the star taking the part of the burning stick, and a rapidly revolving inclined disc of plate glass, that of the water in the basin. The ray of light on its passage from the object-glass to the eye-piece has to traverse an oblique disc of glass $\frac{1}{4}$ of an inch thick, which disc can be made to revolve at any desired velocity, the bending of the ray of light in its passage through the plate glass causes the image of the star to become a disc, and this is only perfect when the rotation of the disc is exactly equal to the frequency of the scintillation.

We have already shown that Professor Dufour considered that there were what may be called personal characteristics attached to certain stars. M. Montigny early applied his ingenious appartus to the investigation of this subject. He selected 41 principal stars, grouped them according to the classification of P. Secchi which was wholly based upon the character of their spectra, and found that the rapidity of the scintillation followed almost precisely the spectroscopic classification—being slowest with stars whose spectra show many lines, and fastest with those whose spectra show only a few principal bands.

The regular observations made at Brussels by M. Montigny date back to 1870, and this series of 14 years forms the basis of the paper the title of which we have already quoted. In it M. Montigny begins by explaining that the indications given by the scintillometer may be divided into three classes.

(1) The intensity of scintillation. This is the most important indication, it gives the number of changes of colour exhibited by the scintillation of the star in a second of time reduced (as already explained) from the observed value to its equivalent at the fixed zenith distance of 60°; we do not see that the author states the average or the extreme rapidity of this scintillation, but from various

* Of course we are not suggesting that position micrometers are usual accompaniments of 3-inch telescopes—we quote them only as fairly equivalent to, though much more costly than, the scintillometer.

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parts of his paper we believe that it may be for a minimum, 20 times a second, for the average 75 times, and during a violent tempest, as great as 233 times in a second.

(2) The various characters of the image produced by the scintillometer. This unfortunately can only be reduced to number in as far as the breadth of the image is concerned—but this is a very important feature, for M. Montigny says that he has long observed that the more the image broadens at the approach of rain the longer will the rain last. The circular image which in fine weather is narrow, perfectly regular and sharply edged, presents on the approach of rain thin filaments breaking off from its edges; the next day the image has become broader, and more irregular, its edge being hazy, undulated or even fringed when rain has begun, and dotted or beaded when a cyclone is near. These progressive changes are a positive indication of approaching disturbances.

(3) The colours which are shown to predominate. These seem to be constant for the same star.

The author then proceeds to epitomize the results obtained on upwards of 1,700 evenings, 1870–84. He divides these into 11 groups, and we give as briefly as possible the results he arrives at respecting each. He states that the influence of rain is so great that he discusses it first.

(1) *Intensity of Scintillation according to Seasons.* 1870-84.

| | Spring | Summer | Autumn | Winter | Mean |
|---|---|---|---|---|---|
| Under the influence of dry weather | 58 | 44 | 59 | 71 | 58 |
| ,, ,, rain ,, | 78 | 68 | 82 | 103 | 83 |
| Mean values | 70 | 62 | 76 | 93 | 75 |
| Excess "during rain" over "dry weather" | 20 | 24 | 23 | 32 | 25 |
| ,, ,, ,, ,, ,, expressed as per cent of "dry weather" | 35 | 55 | 39 | 45 | 43 |

M. Montigny contents himself with remarking that in all seasons the scintillation is notably increased during rainy periods, and that this intensity is even more marked in winter than in summer. We are inclined to think that M. Montigny has here fallen into error. At the bottom of his table we have added two lines; the first gives the excess in wet weather, expressed in scintillations, and is doubtless the series of figures which led him to the above conclusion; but the second line gives the ratio of scintillation in dry, and in wet weather, whence it will be seen that though the excess in the number of scintillations is greatest in wet weather in winter, the excess is not relatively so great as in other seasons; probably additional observations will show that the influence of rain is equal at all seasons.

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(2) *Influence of the number of rainy days.*

On classifying the evenings of great and of little scintillation, we find that the former, with a mean scintillation frequency of 133, were followed by 86 per cent of wet days, the latter of 31, by only 45 per cent.

(3) *Influence of the approach of rain.*

Scintillation notably increases on the approach, and decreases on the cessation, of rain.

(4). *Influence of the sequence of wet days.*

Scintillation is much greater when there are three successive wet days, *i.e.*, the day of observation and the two following days; and somewhat less so when the day of observation is between two wet days. The average is 80 when it rains on the day of observation and on the following day, but only 66 when the rain follows on the two subsequent days.

(5). *Influence of cyclones.*

Kaemtz has already remarked that scintillation is excessive during times of atmospheric disturbance. M. Montigny states that his researches fully confirm this, and he gives extremely high rates of scintillation (211 and 233) as having occurred during the storms of February 26, 1876, and October 24, 1882. He states that the scintillation gradually increases as the depression approaches, and decreases as it passes away.

(6). *Influence of the approach of rain on the altitude at which the changes of colour in a scintillating star cease to be perceptible.*

According to Humboldt, the arrival of the rainy season in the tropics is announced many days in advance by the scintillation of the stars at high altitudes, although in those regions scintillation is unusual. At Brussels changes of colour are perceptible at greater altitudes before rain than before dry weather.

(7). *Influence of the humidity of the air.*

In order to detect this, it is necessary to avoid instances influenced by approaching rain; this M. Montigny has attempted to do, and he finds that *in dry weather* the scintillation increases with increasing humidity.

(8). *Influence of fog.*

In dry weather scintillation increases when fog will be formed in the evening after observation, but it does not increase if fog will follow the next day or even the next morning. Probably, in the former case, the formation of fog particles has already commenced in the higher regions when the observation is made.

(9). *Influence of snow.*

While the air is full of snow there are sometimes rifts through

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which the stars shine. It is found that they then scintillate more than usual, and more than is due to temperature alone.

(10). *Influence of temperature.*

In order to study this, it is necessary to select periods free from the influence of rain. Having done so, the following values were obtained :—

| Limits of Temperature. | Mean Temperature. | Intensity of Scintillation. | M.T. × I. of S. |
|---|---|---|---|
| 77° to 68° ..... | 70°·3 ..... | 39 | 2742 |
| 68 ,, 59 ..... | 63 ·5 ..... | 44 | 2794 |
| 59 ,, 50 ..... | 52 ·3 ..... | 55 | 2876 |
| 50 ,, 41 ..... | 44 ·6 ..... | 60 | 2676 |
| 41 ,, 32 .. .. | 37 ·6 .. ... | 75 | 2820 |
| 32 ,, 23 ..... | 24 ·8 ..... | 99 | 2455 |
| 23 ,, 14 ..... | 18 ·1 ..... | 103 | 1864 |

To M. Montigny's table we have added a column which conclusively proves his statement. The figures are the result of multiplying together the mean temperature and the scintillation; if the one increases as the other decreases the resultant should be nearly constant and (except for the values below freezing point) this proves remarkably the case.

M. Montigny himself seems to have scarcely realized the extreme closeness of the agreement for he does not speak so confidently respecting it, as respecting other conclusions for which evidence of equal strength is not given.

(11). *Influence of wind.*

No numerical values are given under this head, but it is pointed out that the influence of cyclones has already been mentioned as well as that of rain, humidity, and temperature. It is somewhat difficult to eliminate the influence of wind from all the foregoing, but M. Montigny mentions one fact worthy of note. When, on a windy evening, the scintillation of many stars is observed, the scintillation is generally found to be greatest in the path of the wind, *i.e.*, in the direction whence it comes and whither it goes.

M. Montigny concludes with the following paragraphs :—

"From the foregoing remarks it appears that it is the amount of water in the atmosphere which chiefly regulates the frequency of scintillation and modifies its characteristics according as this water is dissolved in vapour, falls as rain, or floats as snow.

"The whole of the facts which I have just epitomized respecting the relations between scintillation and atmospheric conditions form the basis of the application of the scintillometer to *weather forecasting*.

"Let me add that this beautiful phenomenon if continuously and carefully studied will be equally useful to Meteorology itself, by the information which it will afford respecting the influence of the earth's atmosphere on stellar light."

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## EXTRAORDINARY FALL OF RAIN AND SNOW IN VIENNA, MAY 15, 1885.

We begin this note by reminding our readers that the rainfall of Vienna on the average of 30 years, is (rather less than that of London) 23·43 inches. This will enable them to realize how exceptional must be a fall of very nearly *six inches* in one day.

It is a common fallacy to consider that England has a monoply of bad weather. We reproduce from the *Zeitschrift d. Oester. Gesell. f. Met.* for June, Dr. Hann's note upon May 15th, as a specimen of how uncomfortable Vienna weather can be.

The evening of May 14th, was dark and showery, with heavy black clouds in S.E., temp. at 9 p.m., 49°. In the morning of the 15th (about 6 a.m.) the wind backed to E. and E.N.E.. and the rain increased. The barometer continued to fall till nearly noon, the temperature remaining about 50°, and rain falling at the rate of about a tenth of-an-inch an hour. About noon the wind backed through N. to W. and it began to blow a gale, the mean hourly velocity for the following 18 hours being 42 miles, and in several hours exceeding 50 miles—the rain (as will be seen by the following table) not only continued but increased, while the temperature fell nearly to freezing point, and about 6 p.m. the rain took the form of a driving mixture of rain and wet snow, which finally ceased almost precisely 24 hours after it had begun, and yielded the extraordinary total of 5·99 inches.

Dr. Hann says "Es war das gräulichste Unwetter, das man sich denken kann"* and the instrumental records quite confirm his opinion. Six men were frozen to death in the suburbs, and a house fell, partly from the force of the gale, and partly from the weight of snow on the roof, while the damage to trees, crops and cattle was excessive.

*Heavy Rainfall at the Centralanstalt, Hohe Warte, Vienna, May 15-16th, 1885.*

| Hour ending | Rain. in. | Hour ending | Rain. in. | Hour. ending | Rain. in. | Hour. ending | Rain. in. |
|---|---|---|---|---|---|---|---|
| 7 a.m. | ·02 | 1 p.m. | ·06 | 7 p.m. | ·36 | 1 a.m. | ·52 |
| 8 ,, | ·06 | 2 ,, | ·09 | 8 ,, | ·25 | 2 ,, | ·30 |
| 9 ,, | ·18 | 3 ,, | ·15 | 9 ,, | ·39 | 3 ,, | ·53 |
| 10 ,, | ·19 | 4 ,, | ·12 | 10 ,, | ·35 | 4 ,, | ·46 |
| 11 ,, | ·15 | 5 ,, | ·26 | 11 ,, | ·44 | 5 ,, | ·16 |
| Noon | ·12 | 6 ,, | ·43 | midn't. | ·30 | 6 , | ·10 |
| Totals... | .72 | | 1·11 | | 2·09 | | 2·07 |

The results of another gauge are given, and therefore treating the above record as that of Gauge A, we give the two records added up for corresponding periods.

*It was the most abominably bad weather that can be imagined.

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| | Centranstalt. Gauge A. in. | Centranstalt. Gauge B. in. | Agricultural School. in. |
|---|---|---|---|
| May 15th, 0 to 7 a.m. | ·02 | ·06 | |
| ,, ,, 7 a.m. to 2 p.m. | ·85 | ·70 | |
| ,, ,, 2 p.m. to 9 p.m. | 1·96 | 1·82 | |
| ,, ,, 9 p.m. to 6 a.m. (16th) | 3·16 | 2·96 | |
| Gross Total | 5·99 | 5·54 | 5·85 |

The gauge at the new Astronomical Observatory was allowed to run over, and therefore became useless.

Dr. Hann remarks that the greatest fall previously recorded was 4·10 in. on the 28th–29th of July, 1882, and that it far exceeded all previous records, the greatest previously having been 2·71 in. on June 30th, 1864, and 2·83 in. on May 16th, 1851

The fact which appears to us the most noteworthy is, that this excessive fall was the product of what must (in spite of its unusual amount) be designated as ordinary rain, *i.e.*, it was not one of those torrential downpours which occur during thunderstorms, and which are variously described as "waterspout," "bursting of a cloud," and so on. It was a *very remarkably prolonged* ordinary heavy rain.

## ATLANTIC TIDES AS STORM WARNINGS.

*To the Editor of the Meteorological Magazine.*

SIR,—I cannot agree with Dr. Muirhead's deduction that the action of the tidal wave, referred to in my letter, is due to the suction of the waters *within* the cyclone area from diminished aerial pressure.

Were this the cause the tide level, on the approach of a cyclone, would rather diminish than increase by the very law which raised the waters within the disturbed area, and an exactly opposite result would be observed until the cyclone was at hand.

The acceleration of the tidal crest in this instance, however, occurs *far in advance of* the mercurial fall, and therefore the Hebrideans, although possessed of good barometers in some places, wisely prefer the warning of tidal level as being certain, to that of the barometer, which, affected by many variable influences, is frequently both slow and deceptive in its action.

The cause appears to me to be due to the increased pressure on the flow and against the ebb of the tide wave, assisted by the flow of the gulf stream, for a considerable distance in advance of an an approaching cyclone, the measure of which, will indicate with certainty, the nature, and to some extent the course, of the disturbance to follow.

Yours' faithfully,

G. WOULFE BRENAN, C.E.

*Oban, Argyllshire.*

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## ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Strachan's letter on the above subject in your June Magazine, will not tend to restore confidence as to the methods adopted for obtaining the relative humidity of the air. The conclusions which I have arrived at are based upon the results of numerous observations and experiments which Professor Tyndall has somewhere called "popping the question" to nature herself. Many of these observations have been witnessed by yourself and others.

I must, therefore, beg to remind Mr. Strachan, that these conclusions are not to be swept away by his preference for one hygrometer or the other, or by any speculation as to the differences which may exist between the temperatures of the inside and outside surfaces of a vessel containing water, the thickness of the sides being about ·01 of an inch. This question is not new to me as will be seen by a reference to my papers on evaporation;* it is a question of which no accurate solution seems possible, but experiment tells me, that the difference is so small as to escape observation. This result is not surprising when it is considered that the specific heat of the water, volume for volume, is more than 3,000 times greater than that of the air by which it is surrounded.

G. DINES.

*Walton-on-Thames, July*, 1885.

## SOLAR HALOS.

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—On the 22nd of June, about mid-day, I observed a halo of perhaps an unusual type. Two bands were visible, but neither of them was very distinct; the inner one was red, and the outer a blue or violet. It was probably visible for about half-an-hour. I cannot find any instance of one similar to it in my previous records of observation on halos. I may add that I saw two distinct parhelia, and the upper arc of a solar halo at 5 p.m. on June 5th.

Your's truly,

R. MONTAGUE MERCER.

*Rodmersham House, near Sittingbourne, July* 9th, 1885.

## ATMOSPHERIC ELECTRICITY.

PROFESSOR PALMIERI, of the Vesuvian Observatory, has recently published some observations of interest on atmospheric electricity. In clear weather the atmospheric electricity is usually positive, if

* See "Proceedings of the Meteorological Society," Vol. V. (1870) page 205 and 300.

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negative a downfall of rain, &c., may be inferred to be going on at some little distance. There is a maximum of atmospheric electricity at 9 a.m., another soon after sunset, which often continues during a great part of the night. A minimum takes place before daybreak, and another in the afternoon. This periodicity is, however, disturbed by atmospheric movements. When the maxima are very pronounced, cloudy weather often follows. If the sky becomes overcast the electric indications grow stronger, and if at the time of the evening maximum the relative moisture increases with a heavy dew, maxima of special duration and intensity may be expected. The assumption that atmospheric electricity becomes stronger with altitude is not borne out by the Vesuvian obervations. Lower potentials are generally observed on hot summer days; in spring and autumn the indications are stronger; in winter they are uncertain. On cloudy days the potential is less intense, but positive; during rain the potential increases. A rain zone is positive but surrounded by a negative zone, which again is surrounded by a zone of positive electricity.* According to Palmieri, there is no thunder and lightning without rain.—*English Mechanic, May* 29th, 1885.

## ROYAL METEOROLOGICAL SOCIETY.

THE concluding meeting of this Society for the present session was held on Wednesday, 17th of June, at the Institution of Civil Engineers, 25, Great George Street: Mr. R. H. Scott, F.R.S., President, in the chair.

Lieut. A. Leeper, R.N., was elected a Fellow of the Society.

The following papers were read :—

(1). "A few Meteorological Observations made on a voyage up the Nile in February and March, 1885," by Dr. W. Marcet, F.R.S. The author, on a voyage up the Nile from Cairo to Assouan, made a series of meteorological observations, and in the present paper gives the result of those relating mainly to nocturnal radiation and to the temperature of the water of the Nile.

(2). "The Mean Direction of Cirrus Clouds over Europe," by Dr. H. H. Hildebrandsson, Hon. Mem. R. Met. Soc. The author has collected a number of observations on the movements of cirrus clouds over various parts of Europe, and after discussing them has arrived at the following results :—(1) The mean direction at all stations lies between south-west and north-west; (2) in winter the cirri come from a more northerly direction, and in summer from a more southerly; (3) in winter the northerly component is greater on the Baltic and the north coast of the Mediterranean; (4) the mean directions of the upper currents nearly coincide with the mean

* Just what Andrew Crosse said half a century since, and not only said, but observed the phenomena, and offered an explanation. See *Memorials of Andrew Crosse*, 1857, 12mo., page 134.—*Ed. Met. Mag.*

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tracks of storm-centres; (5) the upper currents of the atmosphere tend in general to flow away from those areas in which a barometrical depression exists at the earth's surface towards those in which there is an elevation of pressure.

(3). "On the Influence of Accumulations of Snow on Climate," by Dr. A. Woeikoff, Hon. Mem. R. Met. Soc.

(4). "Note on the Weather of January, 1881," by Mr. C. Harding, F.R. Met. Soc. It will be remembered that the weather of January, 1881, was remarkable for the prolonged and exceptionally severe frost, the heavy gale of the 18th and 19th, and the snow-storms. The author has prepared isobaric charts for the North Atlantic and the adjacent continents for January, 1881, and compared them with similar charts for January in other years. He shows that the severe weather in 1881 was due to a reversal of the normal conditions, the atmospheric pressure being high in the north and low in the south.

(5). "Results of Meteorological Observations made in the Solomon Group, 1882-84," by Lieut. A. Leeper, R.N.

(6). "Graphic Hygrometrical Table," by Mr. D. Cunningham, M. Inst. C.E., F.R. Met. Soc.

## CURIOUS RECORD OF A HAIL STORM.

In a very old farmhouse at Biscot, near Luton, Bedfordshire, the following inscription is engraved on an old stone chimney-piece:—"There was hailstones fell July 23, of this bigness and likeness, 1666. T. T." One "likeness" shows a circular stone, half an inch in diameter, another is oval, and measures an inch in length. W. G. S.—*Gardener's Chronicle*, May 9th, 1885.

## INTERIOR TEMPERATURE OF THE EARTH.

The German Government is having a deep shaft sunk near Schladebach [between Merseburg and Leipzig], with the object of obtaining various kinds of scientific information, and especially trustworthy *data* concerning the rate of increase of the earth's temperature as we descend into the interior. The excavation is being carried on by a diamond-tipped borer driven by water. As far back as the beginning of this year the shaft had reached the depth of 1,392 mètres [4,567 ft.], which is believed to be the lowest depth yet reached by boring. The temperature at successive stages is ascertained by an ingenious instrument which serves as a special thermometer, the principle of construction being the fact that as the heat increases, the mercury will expand so as to flow over the lip of a sufficiently short open tube in greater and greater quantities. The measurement of the differences of those overflows will give the rate of increase of the temperature. It has been ascertained that the temperature at the depth of 1,392 mètres [4,567 ft. or $\frac{7}{8}$ of a mile] was 49° Centigrade, or 120° Fahrenheit. If the temperature increases regularly at this rate, the boiling point of water ought to be reached at a depth of 3,000 mètres [9,843 ft. or nearly 2 miles], and at 75 kilomètres [47 miles], we should find the heat at which platinum melts. This would go to show that the thickness of the earth's crust cannot be more than about one-ninetieth of its radius.—*The Times.*

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1884.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | TotalRain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 55·7 | 8 | 28·5 | 31 | 45·9 | 36·6 | 37·1 | 85 | 66·7 | 22·2 | 2·57 | 17 | 7·3 |
| Malta | 66·2 | 10*a* | 44·6 | 23 | 61·9 | 52·8 | 50·2 | 83 | 109·4 | 37·9 | 4·87 | 15 | 4·9 |
| *Mauritius* | 86·0 | 19 | 66·4 | 5 | 83·1 | 71·2 | 65·6 | 71 | 136·4 | 57·5 | 1·56 | 13 | 5·4 |
| Calcutta | 78·9 | 28 | 52·7 | 10 | 76·4 | 56·5 | 55·6 | 73 | 133·2 | 37·6 | ·00 | 0 | 1·6 |
| Bombay | 88·0 | 10*b* | 66·6 | 23*c* | 83·4 | 68·9 | 63·5 | 67 | 142·1 | 53·4 | 1·14 | 2 | 2·9 |
| Ceylon, Colombo | 89·0 | 4 | 69·1 | 27 | 85·2 | 72·9 | 69·1 | 71 | 150·0 | 63·0 | 14·30 | 13 | 6·0 |
| *Melbourne* | 89·3 | 31 | 43·3 | 1 | 72·5 | 52·5 | 49·0 | 66 | 150·6 | 36·9 | 3·05 | 15 | 6·2 |
| *Adelaide* | 97·6 | 29 | 47·9 | 23 | 77·1 | 57·1 | 47·1 | 49 | 160·7 | 32·5 | ·96 | 13 | 5·1 |
| *Wellington* | 70·0 | 2 | 44·3 | 13 | 64·2 | 53·3 | .. | ... | 145.0 | 40·0 | 12·46 | 23 | ... |
| *Auckland* | 75·5 | 16 | 51·0 | 3 | 68·6 | 55·9 | 53·1 | 72 | 144·0 | 43·0 | 5·66 | 19 | 6·0 |
| Kingston | 89·5 | 1 | 63·3 | 29 | 86·6 | 67·9 | 68·5 | 79 | ... | 58·8 | ·00 | 0 | 2·8 |
| Barbados | 80·0 | 1*d* | 69·0 | 23*e* | 78·0 | 70·0 | 68·8 | 80 | 140·0 | ... | 4·07 | 10 | 5·0 |
| Toronto | 50·6 | 31 | —13·3 | 19 | 31·7 | 18·8 | 24·5 | 83 | 94·0 | —14·0 | 3·26 | 17 | 7·7 |
| New Brunswick, Fredericton | 48·8 | 30 | —28·5 | 28 | 28·1 | 8·0 | 19·2 | 88 | ... | ... | 6·51 | 17 | 5·5 |
| Manitoba, Winnipeg | 41·3 | 2 | —43·6 | 23 | 4.6 | —11·5 | 5·0 | 94 | ... | ... | 1·11 | 8 | 5·5 |
| British Columbia, Victoria | 54·0 | 1 | 8·0 | 29 | ... | ... | ... | ... | ... | ... | 1·95 | 11 | ... |

*a* And 13. *b* And 18. *c* And 29. *d* And 11, 12. *e* And 24, 25.

### Remarks, December, 1884.

Malta.—Mean temp. 56°·5; mean hourly velocity of wind 11 miles; sea temp. fell from 65° to 62°. TS8 on 2 days, H on 22nd and 24th. J. Scoles.

*Mauritius.*—Rainfall 3·79 in. and temp. 1°·0 below average; prevailing direction of wind E. and E.N.E. Scarcely any unusual colorations of sky. C Meldrum, F.R.S.

Colombo.—TS8 on 3 days, L on 8th and 30th. F. C. H. Clarke, Major, R.A.

*Melbourne.*—Mean temp. 2°·2 and temp. of dew point 1°·2 below their respective averages, rainfall 0·69 in. above average, humidity and amount of cloud both slightly above average. Prevailing winds W., S. and S.W. strong on 10 days, heavy squalls on 3 days. TS with H on 7th, L on 14th. R. L. J. Ellery, F.R.S.

*Adelaide.*—Remarkable for low pressure, coolness, and the force of the wind. Mean pressure nearly ·10 in. below the average of the previous 28 years, and the lowest on record. The mean temp. (67°·1) was nearly 4° less than the average and the lowest on record since 1856; temp. reached 90° on only 4 days, the average number being 9. The total horizontal motion of the wind, 10,990 miles, was far in excess of any previous record; but notwithstanding the unusually stormy weather, the rainfall was only 0·12 in excess of the mean for the previous 27 years. C. Todd.

*Wellington.*—Showery weather up to 12th. heavy R being recorded on 5th, 6th and 11th; tolerably fine then until the 23rd; remainder of the month showery, with heavy R, 3·48 in., the max. for the month on the night of 28th. Total rainfall 8·81 in. above the average, number of wet days more than twice the average, mean temp. 2°·5, and pressure slightly, below average. R. B. Gore.

*Auckland.*—The early portion of the month was unsettled and showery; from 9th to 19th, mostly fine and pleasant, the close of the month variable and showery with occasional heavy TS8. Rainfall greatly in excess. T. F. Cheeseman.

Kingston.—The rainfall for the month over the whole Island, was less than half the average, rivers giving out, the Llandovery never known to be dry before this year being dry for the 4th time in 1884. Maxwell Hall.

Barbados.—Mean temp. 74°, 1°·1, and rainfall 36 per cent. below the average for 25 years. R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 2·19 | XI. | Rhayader, Nantgwillt.. | 2·40 |
| ,, | Margate, Birchington... | ·84 | ,, | Carno, Tybrith ... ..... | 2·23 |
| ,, | Littlehampton ..... | 1·67 | ,, | Corwen, Rhug ..... | 1·72 |
| ,, | Hailsham ..... | ·72 | ,, | Port Madoc ..... | 2·98 |
| ,, | I. of W., St. Lawrence. | 2·51 | ,, | I. of Man, Douglas ..... | 1·70 |
| ,, | Alton, Ashdell..... | 2·02 | XII. | Stoneykirk, Ardwell Ho. | ·67 |
| III. | Winslow, Addington ... | 1·91 | ,, | Melrose, Abbey Gate... | ·74 |
| ,, | Oxford, Magdalen Col... | 1·67 | XIII. | N. Esk Res. [Penicuick] | 1·10 |
| ,, | Northampton ..... | 1 72 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | 2·75 | ,, | Glasgow, Queen's Park. | ·80 |
| ,, | Wisbech, Bank House.. | 1·83 | XV. | Islay, Gruinart School.. | 1·94 |
| IV. | Southend ..... | ·80 | XVI. | St. Andrews, Newton Bk | ·72 |
| ,, | Harlow, Sheering ... .. | 1·82 | ,, | Balquhidder, Stronvar.. | 1·99 |
| ,, | Rendlesham Hall ..... | ·85 | ,, | Dunkeld, Inver Braan.. | ·68 |
| ,, | Diss ..... | ·72 | ,, | Dalnaspidal H.R.S. ... | 1·46 |
| ,, | Swaffham ..... | 1·30 | XVII. | Keith H.R.S. ..... .... | 1·48 |
| V. | Salisbury, Alderbury... | 1·93 | ,, | Forres H.R.S. ..... ... | 1·68 |
| ,, | Warminster ..... | 1·21 | XVIII. | Strome Ferry H.R.S.... | 4·14 |
| ,, | Calne, Compton Bassett | 1·63 | ,, | Lochbroom ..... | 2·91 |
| ,, | Ashburton, Holne Vic.. | 2·06 | ,, | Tain, Springfield..... | 1·32 |
| ,, | Holsworthy, Clawton... | 3·04 | ,, | Loch Shiel, Glenaladale | 5·99 |
| ,, | Hatherleigh, Winsford. | 3·63 | ,, | Invergarry ..... | 2 45 |
| ,, | Lynmouth, Glenthorne. | 2·25 | XIX. | Lairg H.R.S. ..... | 2·16 |
| ,, | Probus, Lamellyn ..... | 2·60 | ,, | Forsinard H.R.S. ..... | 2·30 |
| ,, | Wincanton, Stowell Rec. | 1·31 | ,, | Watten H.R.S. ..... | 2·55 |
| ,, | Wells, Westbury..... | 1·13 | XX. | Dunmanway, Coolkelure | ·65 |
| VI. | Bristol, Clifton ..... .. | 1·73 | ,, | Fermoy, Gas Works ... | 1·73 |
| ,, | Ross ..... | 2·33 | ,, | Tralee, Castlemorris ... | 1·46 |
| ,, | Wem, Sansaw Hall..... | ... | ,, | Tipperary, Henry Street | ·11 |
| ,, | Cheadle, The Heath Ho. | 3·54 | ,, | Newcastle West ..... | ... |
| ,, | Worcester, Diglis Lock | 3·63 | ,, | Miltown Malbay..... | 1·50 |
| ,, | Coventry, Coundon ..... | 2·38 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 1·85 | XXI. | Carlow, Browne's Hill.. | 1·20 |
| ,, | Ketton Hall [Stamford] | 2·67 | ,, | Navan, Balrath ..... | 1·01 |
| ,, | Horncastle, Bucknall ... | 2·24 | ,, | Mullingar, Belvedere ... | ·86 |
| ,, | Mansfield, St. John's St. | 3·71 | ,, | Athlone, Twyford ..... | ·89 |
| VIII. | Macclesfield, The Park. | 3·33 | XXII. | Galway, Queen's Col.... | ·50 |
| ,, | Walton-on-the-Hill..... | 2·18 | ,, | Clifden, Kylemore ..... | 1·83 |
| ,, | Lancaster, South Road. | 2·04 | ,, | Crossmolina, Enniscoe.. | ·54 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | ·56 |
| IX. | Wakefield, Stanley Vic. | 2·45 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 3·01 | ,, | Rockcorry..... | ... |
| ,, | Scarborough..... | 2·84 | ,, | Warrenpoint ..... | ·93 |
| ,, | East Layton [Darlington] | 2·04 | ,, | Newtownards ..... | ... |
| ,, | Middleton, Mickleton.. | 1·59 | ,, | Belfast, New Barnsley.. | 1·15 |
| X. | Haltwhistle, Unthank.. | 1·24 | ,, | Cushendun ..... | ·85 |
| ,, | Shap, Copy Hill ..... | 1·43 | ,, | Bushmills ..... ..... | 1·11 |
| XI. | Llanfrechfa Grange . ... | 2·84 | ,, | Stewartstown ..... | .71 |
| ,, | Llandovery ..... | 3·19 | ,, | Buncrana ..... | ·84 |
| ,, | Castle Malgwyn ..... | 1·92 | | | |

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# JUNE, 1885.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg | Date | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. London (Camden Square) | 1·99 | — ·68 | ·79 | 8 | 11 | 84·7 | 4 | 41·4 | 11 | 0 | 0 |
| II. | Maidstone (Hunton Court) | 1·21 | — ·86 | ·36 | 8 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | Strathfield Turgiss | 1·79 | — ·31 | ·48 | 16 | 9 | 83·1 | 4 | 36·4 | 11 | 0 | 0 |
| III. | Hitchin | 2·63 | + ·50 | 1·44 | 8 | 11 | 75·0 | 4 | 35·0 | 10 | 0 | ... |
| ,, | Banbury | 2·30 | — ·14 | ·77 | 8 | 11 | 82·0 | 4 | 37·0 | 11 | 0 | ... |
| IV. | Bury St. Edmunds (Culford) | ·93 | — 1·34 | ·33 | 8 | 11 | 88·0 | 3 | 33·0 | 10*e* | 0 | ... |
| ,, | Norwich (Cossey) | ·96 | — 1·26 | ·35 | 8 | 8 | 83·5 | 4 | 38·0 | 11*f* | 0 | ... |
| V. | Weymouth(LangtonHerring) | 1·46 | ... | ·41 | 5 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | Barnstaple | 3·62 | + ·90 | 1·21 | 23 | 10 | 83·5 | 5 | 45·0 | 1 | 0 | ... |
| ,, | Bodmin | 2·70 | — ·51 | 1·32 | 23 | 11 | 72·0 | 13*b* | 45·0 | 10 | 0 | 0 |
| VI. | Stroud (Upfield) | 1·95 | — ·43 | ·37 | 6 & 8 | 11 | 81·0 | 4 | 44·0 | 10 | 0 | ... |
| ,, | ChurchStretton(Woolstaston) | 3·81 | + ·94 | ·95 | 23 | 11 | 79·5 | 4 | 41·5 | 10 | 0 | ... |
| ,, | Tenbury (Orleton) | 2·79 | + ·05 | ·73 | 6 | 10 | 80·7 | 4 | 38·0 | 11*g* | 0 | 0 |
| VII. | Leicester | 2·55 | ... | ·84 | 6 | 11 | 84·5 | 4 | 39·2 | 11 | 0 | 4 |
| ,, | Boston | 2·27 | + ·02 | 1·10 | 7 | 9 | 87·0 | 3 | 40·0 | 27 | 0 | ... |
| ,, | Grimsby (Killingholme) | 3·44 | + 1·07 | 1·11 | 8 | 13 | 80·5 | 4 | 41·0 | 11 | 0 | ... |
| ,, | Hesley Hall [Tickhill] | 2·79 | ... | ·65 | 6 & 8 | 9 | 86·0 | 4 | 39·0 | 2*h* | 0 | ... |
| VIII. | Manchester (Ardwick) | 3·96 | + ·80 | ·84 | 23 | 12 | 83·0 | 4 | 45·0 | 11*i* | 0 | ... |
| IX. | Wetherby (Ribston Hall) | 3·44 | + ·57 | 1·15 | 24 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | Skipton (Arncliffe) | 3·25 | — ·57 | ·63 | 18 | 12 | 80·0 | 13 | 38·0 | 26 | 0 | ... |
| X. | North Shields | 1·62 | — ·41 | ·81 | 24 | 9 | 77·8 | 12 | 39·0 | 10 | 0 | 0 |
| ,, | Borrowdale (Seathwaite) | 6·15 | — 1·66 | 2·28 | 18 | 13 | 73·7 | 28 | 38·5 | 26 | 0 | ... |
| XI. | WALES. Cardiff (Ely) | 2·88 | — ·18 | ·95 | 23 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | Haverfordwest | 2·50 | — ·53 | ·60 | 8 | 10 | 73·0 | 13 | 40·0 | 1*j* | 0 | 1 |
| ,, | Plinlimmon (Cwmsymlog) | 3·14 | ... | ·75 | 22 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | Llandudno | ·95 | — 1·05 | ·32 | 6 | 8 | 74·0 | 3 | 45·2 | 10 | 0 | ... |
| XII. | SCOTLAND. Cargen [Dumfries] | ·92 | — 2·25 | ·39 | 18 | 9 | 74·0 | 28 | 35·4 | 10 | 0 | ... |
| ,, | Jedburgh (Sunnyside) | ·49 | — 1·91 | ·13 | 28 | 8 | 75·0 | 13*c* | 35·0 | 10*k* | 0 | ... |
| XIV. | Douglas Castle (Newmains) | ·68 | — 2·33 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XV. | Lochgilphead (Kilmory) | 2·69 | — 1·15 | ·75 | 3 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | Oban (Craigvarren) | 2·98 | ... | ·62 | 18 | 17 | 69·5 | 28 | 41·5 | 10 | 0 | ... |
| ,, | Mull (Quinish) | 3·49 | ... | ·72 | 18 | 16 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices | ·80 | — 1·97 | ·20 | 19*a* | 6 | ... | ... | ... | ... | ... | ... |
| ,, | Arbroath | ·85 | — 1·76 | ·19 | 20 | 8 | 70·0 | 3 | 41·0 | 10 | 0 | ... |
| XVII. | Braemar | 1·23 | — 1·86 | ·49 | 28 | 12 | 71·0 | 28 | 32·1 | 9 | 0 | ... |
| ,, | Aberdeen | 1·07 | ... | ·39 | 18 | 10 | 77·0 | 12 | 35·0 | 9 | 0 | ... |
| XVIII. | Skye (Sligachan) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | Culloden | ·80 | — 1·45 | ... | ... | ... | 74·0 | 27 | 36·0 | 10 | 0 | 3 |
| XIX. | Dunrobin | 1·94 | ... | ·42 | 18 | 10 | 72·0 | 27 | 38·0 | 10 | 0 | ... |
| ,, | Orkney (Sandwick) | 2·50 | + ·70 | ·36 | 18*c* | 21 | 61·4 | 5 | 39.5 | 26 | 0 | 4 |
| XX. | IRELAND. Cork (Blackrock) | 1·19 | — 2·36 | ·43 | 4 | 6 | 83·0 | 28 | 41·0 | 5 | 0 | ... |
| ,, | Dromore Castle | 1·56 | ... | ·50 | 4 | 8 | 70·0 | 29 | 41·0 | 30 | 0 | ... |
| ,, | Waterford (Brook Lodge) | 1·51 | ... | ·55 | 7 | 9 | 71·0 | 28 | 38·0 | 10 | 0 | 8 |
| ,, | Killaloe | 1·58 | .. | ·36 | 4 | 10 | 76·0 | 28 | 43·0 | 26*l* | 0 | ... |
| XXI. | Portarlington | 1·03 | — 1·40 | ·31 | 7 | 10 | 73·5 | 12 | 40·0 | 25 | 0 | ... |
| ,, | Dublin (FitzWilliam Square) | 1·51 | + ·69 | ·50 | 7 | 8 | 73·3 | 3 | 40·9 | 10 | 0 | 0 |
| XXII. | Ballinasloe | ·73 | — 2·46 | ·18 | 4 | 9 | 70·0 | 11*d* | 37·0 | 6*m* | 0 | ... |
| XXIII | Waringstown | ·77 | — 1·89 | ·15 | 4 | 12 | 83·0 | 7 | 35·0 | 9 | 0 | ... |
| ,, | Londonderry (Creggan Res.) | 1·00 | ... | ·19 | 2 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | Omagh (Edenfel) | ·78 | — 2·27 | ·21 | 18 | 10 | 72·0 | 28 | 36·0 | 5*n* | 0 | 3 |

*a* And 20. *b* And 14. *c* And 28. *d* And 12, 13 and 29. *e* And 27. *f* And 28. *g* And 2
*h* And 10. *i* And 26, 27. *j* And 2, 27. *k* And 26. *l* And 27. *m* And 28. *n* And 29.

# METEOROLOGICAL NOTES ON JUNE.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The rains of the early part wonderfully improved the hay crop, which, however, was not heavy; cutting began on 15th. Corn crops and beans doing well; hops favourable and free from aphis. Common blue and meadow brown butterflies flying on 1st; dog rose in flower on 12th; honey-suckle on 18th.

BANBURY.—Mean temp. 57° 5. A favourable month, rains in the early part very useful; haymaking general at the end, in fine drying weather. L on 7th, 14th and 18th; high wind on 18th.

CULFORD.—A very dry month with some very hot days, followed by cold nights. Apple crop very blighted and thin.

LANGTON HERRING.—On the whole a fine month; haymaking during the last week under very favourable conditions; crop heavy. Dense fogs occurred on 5th, 6th and 7th, which with those of the last week in May, blighted the fruit trees to some extent. There were fogs on 19th, 22nd, and 23rd, also.

BODMIN.—Mean temp., 61°·3.

STROUD.—L in North at 9 p.m. on 7th.

WOOLSTASTON.—T and L on 7th.

ORLETON.—Very variable temp., with many bright days and cold nights; very warm till the 5th, then cloudy and rainy till the 11th, fine and warm again till the 15th, after which it was generally cold and stormy to the end of the month. Mean temp. about 0°·8 above the average of 24 years. Prevailing wind N.W. to N.E., frequently rough and cold. All vegetation late, but generally luxuriant. L and T on 7th, L on 13th.

KILLINGHOLME.—The beginning of the month was warm, ; heavy R followed and temp. fell; the nights were cold throughout, checking the growth of root crops; grass and corn crops looking well. Earthquake slightly heard and felt about 11 a.m. on 17th; distant T and L on night of 7th.

MANCHESTER.—On the whole a fine month, but temp. was, with some exceptions, rather chilly, especially at night. Vegetation, however, made great progress, and agricultural prospects are good.

SEATHWAITE.—A severe shock of earthquake was felt at 5·45 a.m. on the 30th.

## WALES.

HAVERFORDWEST.—Up to the 13th, fine, warm, growing weather prevailed; a good deal of R fell between the 4th and 8th; after the 14th, temp. was greatly in defect, strong polar currents prevailing. This weather had a very injurious effect on the fruit trees, disappointing the early promise, blossom having been most abundant. The wind on 28th, 29th, and 30th was very violent, with sudden squalls, snapping the gooseberry and currant trees. T and L, with copious R, on the night of 4th. Mean temp. considerably below average; grass temp. on ten nights very low for June.

LLANDUDNO.—A month of bright, very dry weather; mean temp. nearly 2° below average, and the range, both diurnal and monthly, considerably below average; polar winds prevalent. Hay crop unprecedentedly light.

## SCOTLAND.

CARGEN.—Notwithstanding more than an average amount of sunshine (240 hours against an average of 230 hours), the mean temp. of the month was 2°·1 below average; the atmosphere, however, was very dry. Vegetation very backward; profusion of blossom on all forest and fruit trees quite remarkable; pears and plums will be a failure as regards fruit.

JEDBURGH.—Though very dry, vegetation progressing greatly. Foliage has not been so luxuriant for many years. The apple and pear crops, which pro-

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mised so well in May, have gone on well, and been little affected by caterpillar; the crop is now certain to be abundant. The leaf of the ash has been much behind that of the oak; the hawthorn has not, more than once or twice, for many years, been so luxuriant in this district. It is worth while remarking that the landrail has been little heard during the month in this district, where in former years its cry was almost constant. The mavis, which was thought to have been killed out by the severe winters two or three years ago, has been very plentiful; blackbirds, also, are exceptionally numerous. The gooseberry crop is light. Wind E. or N.E. on ten days.

OBAN.—Decidedly a cold June, with less than the usual sunshine, and frequent showery weather. Hay crop strong, but much requiring sunshine. Inland birds not so plentiful as last year, but wild flowers unusually large and attractive. Two slight shocks of earthquake were felt in this district, but not near Oban. Cloud fogs at sea level were very prevalent; that of the 27th being specially noteworthy, rising and falling on the hill side until finally by the cold N.E. wind in the upper, and S.W. in the lower sky, it was driven into a long stretch of sunlit white cloud of dazzling brilliancy. The phenomenon lasted all day.

QUINISH.—The 27th and 28th were hot days, but the month, as a whole was cold and showery. Vegetation unusually backward.

CULLODEN.—The month was only moderately warm. From 1st to 7th, and 9th to 19th, and then from 22nd to the close, the weather was very dry; crops and pasture land suffering.

## IRELAND.

DROMORE.—A very fine month, with very strong N.E. winds at times.

KILLALOE.—Beautiful weather throughout; all that could be desired for early haymaking. Mean temp. 58°·9.

DUBLIN.—A dry, cool, generally fine month. Polar winds predominated, but much warm sunshine modified their searching character. All the rainfall occurred in a few heavy downpours. A striking feature of the month on several occasions was the luminous appearance of strands of cirrus cloud on the northern horizon late at night, and which was clearly due to reflected daylight. There was no sleet or H, nor did electrical disturbances occur near Dublin. An aurora borealis was seen on the night of the 9th; solor halos on 6th and 10th; fog on 1st and 7th. Mean temp. (54°·8) 1°·8 below the average; colder than any June for 20 years, except 1882, when the mean temperature was 54°·7. In 1869 and in 1879, the celebrated cold year, the mean temp. (54°·9) very closely approximated to that of June, 1885. Mean humidity 74; mean amount of cloud 5·1; prevailing winds N.E., N.W., W.S.W.

WARINGSTOWN.—Very dry but not warm.

EDENFEL.—Bright fresh and charming weather, excellent for haymaking, but much too dry for all other crops. Rainfall the smallest, except 1865, for 21 years. Frost on 3 nights, doing much damage to low-lying potatoe fields; this has not occurred here before within the above-named period.

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## ERRATA IN THE METEOROLOGICAL MAGAZINE 1884.

### REGULAR TABLE.

| | | | | | |
|---|---|---|---|---|---|
| Hunton Court, August, | *should be* | ·91 | Culloden, March, *should be* ... | | 1·37 |
| Barnstaple, October, | ,, | 3·98 | Edenfel, April, | ,, ... | 1·38 |
| ,, November | ,, | 2·98 | | | |

### SUPPLEMENTARY TABLE.

| | | | | | |
|---|---|---|---|---|---|
| Birchington, February, | *should be* | 1·44 | Walton-on-the-Hill, July, | *should be* | 4·30 |
| Stowell Rect., December, | ,, | 3·43 | Nantgwillt, December, | ,, | 10·31 |
| Coundon, March, | ,, | 2·39 | Carrick-on-Shannon, Jan., | ,, | 4·71 |
| ,, April, | ,, | 2·00 | | | |
| ,, November, | ,, | 1·84 | | | |

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXV.] AUGUST, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## "THE TIMES" ON THE DROUGHT AND ON THE RAINFALL ORGANIZATION.

[ONE of the difficulties attaching to my position is that of deciding when, and whether, any particular notice of rainfall work should be reprinted. If I do reprint notices favourable to it, I lay myself open to criticism for conceit, for "blowing my own trumpet," &c. If I do not reprint them, the encouragement to my correspondents and helpers which these comments offer reaches only those who see the originals—does not reach more than a portion of those observers without whose help my work would abruptly terminate.

The observers and I are mutually dependent; the staff would hardly have reached what it has without me, and I could have done little without the staff; therefore any favourable (or unfavourable) remarks must be shared between us, and on the whole I believe that it is my duty to run the risk of being called conceited, and, when the organization receives praise—and along therewith useful information is given, I think that it is right to give it as wide a circulation as possible.—G. J. S.]

### ANOTHER DROUGHT.

*To the Editor of the Times.*

SIR,—Before submitting a few facts respecting the extremely dry July which has just closed, it will be well to look back a few years and recall our recent experience.

Rainfall observations have now been made uninterruptedly in this country for 160 years, not, alas! at any one place, but by careful calculation I have obtained values which are, I believe, very near the truth for every year from 1726 to 1885. During the whole of this long period there is no instance of more than five consecutive years being wet until we come to recent years, and then we have the unprecedented fact of nine consecutive years (1875 to 1883), each wetter than the average; in short, the quantity in those nine years was as great as usually falls in ten years and a quarter.

In 1884 (just as in 1834, 1844, 1854, 1864, and 1874) the fall was below the average, and complaints of drought and of deficient water supply immediately



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arose. As I have dealt with this subject elsewhere, it is unnecessary to do more here than recall the recollection of the complaints in 1884.

I have not had time to thoroughly examine the records of the early months of 1885, but my impression is that up to the middle of June the fall did not differ materially from the average, but the latter half of June was very dry.

I now come to July, which has been so remarkably dry, that I am sure the facts will be examined with interest. I append them in the form of a table, with, at the end, notes by some of my correspondents. How much I am indebted to them it is needless for me to point out.

I am, Sir, your obedient servant,

G. J. SYMONS, F.R.S.

62, *Camden Square, N. W., Aug.* 3.

## *Rainfall in July*, 1885.

| County. | Station. | Average in July, 1870-79. | July, 1885. | Deficiency. |
|---|---|---|---|---|
| | | in. | in. | in. |
| Middlesex | London, Camden Square | 2·47 | 0·52 | 1·95 |
| Kent | Maidstone, Hunton Court | 2·04 | 0·21 | 1·83 |
| Kent | Hythe | 2·46 | 0·47 | 1·99 |
| Hants | I. of Wight, St. Lawrence | 2·48 | 0·70 | 1·78 |
| Hants | Strathfield Turgiss | 2·30 | 0·22 | 2·08 |
| Herts | Hitchin | 2·70 | 0·10 | 2·60 |
| Bucks | Newport Pagnell | 2·70 | 0·14 | 2·56 |
| Norfolk | Swaffham | 3·44 | 1·10 | 2·34 |
| Wilts | Salisbury, Alderbury | 2·75 | 0·16 | 2·59 |
| Devon | Okehampton | 3·42 | 2·07 | 1·35 |
| Devon | Holsworthy | 3·23 | 1·14 | 2·09 |
| Gloucester | Clifton | 3·25 | 0·97 | 2·28 |
| Lincoln | Ulceby, Killingholme | 2·78 | 0·66 | 2·12 |
| York | Skipton, Arncliffe | 4·95 | 1·43 | 3·52 |
| Northumberland | North Shields | 2·55 | 1·59 | 0·96 |
| Monmouth | Newport, Llanfrechfa | 3·69 | 0·71 | 2·98 |
| Kirkcudbright | Cargen, near Dumfries | 3·13 | 2·68 | 0·45 |
| Kinross | Loch Leven | 3·05 | 1·00 | 2·05 |
| Forfar | Arbroath | 2·64 | 0·79 | 1·85 |
| Cork | Black Rock | 2·84 | 1·32 | 1·52 |
| King's County | Portarlington | 2·68 | 1·26 | 1·42 |
| Galway | Ballinasloe | 2·88 | 2·75 | 0·13 |
| Down | Waringstown | 3·58 | 1·85 | 1·73 |

REMARKS.

HITCHIN.—The driest month since the record was begun, in 1849.

HOLSWORTHY.—The driest and finest month for many years.

ULCEBY.—A very dry month, some very hot days, but no thunder or lightning.

NEWPORT, MON.—Very hot until 28th.

CARGEN, DUMFRIES.—First half cold, second half unusually warm. Swarms of aphides.

WARINGSTOWN.—The finest haymaking season in my recollection.

G. J. S.

## *Leading Article in* "TIMES," *of August 5th*, 1885.

"Mr. G. J. Symons writes to us this morning on a subject which is daily becoming of more serious and alarming importance. For six weeks the British Isles have been suffering from what may now be called a drought. Last year was very dry, and 1885 threatens to be drier still. During the nine previous years the country had been complaining of an excess of moisture. Rainfall observations, Mr. Symons says, have been compiled, though not

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always very methodically, for a hundred and sixty years. He is in possession of statistics, more or less complete, for that long period. In the whole of it there had been till 1875 to 1883 no instance of a series of more than five wet years. Nature maintains her averages, after a somewhat rough fashion; and it appears as if the balance were about to be redressed by as extraordinary a continuity of drought. Not only here and there has the absence of rain been felt. There will always be localities which, by some accident of the geographical features, as, for example, the vicinity of more attractive hills and woods, are left occasionally unvisited by showers. Last year and this the experience has virtually been universal. South and north, east and west, have vied in dryness. Down has been parched proportionately as much as Middlesex. Monmouthshire has been as rainless as Hampshire. The barometer itself does not seem to have known what to make of the weather. It has constantly been promising relief, and has as regularly failed to keep its pledge. Some slight showers fell yesterday, [Aug. 4th], but there is no security that they are the advance guard of the downfall we need. America has so often failed to send us her storms, that it is impossible to be sanguine that the cyclone which has just done so much damage across the Atlantic will bring rain to our own fields. Our need is very great. Wells half emptied by the demands of last year are positively dry in many quarters now. Water refused by the clouds has been imperatively needed for cattle and gardens, and has had to be fetched, often from great distances. Nobody can tell how the kingdom will fare unless the clouds descend. The fear is that they may reserve their bounty until it will be like the shower of gold on Danae's head, and kill the harvest it is wanted to enrich.

"Want of rain is reducing the meadows to the apparent condition of a Board school playground. It burnt up the strawberries, and keeps the apples thin and withered. It is attenuating the straw and grain in the cornfields. Under its influence a premature autumn is settling down upon the foliage. Yet agriculturally there are compensations. A drought gives a light hay crop double sweetness and nutritiousness. Grain is better for being roasted than for rotting. If roots offer at present a most lugubrious appearance, they enjoy wonderfully recuperative properties. They are not of a sensitive temper like wheat and grass. They do not sulk and refuse to drink because the clouds have deferred their hospitality. Weather lore always cuts both ways. If "a wet August never brings dearth," so too "a dry August and warm doth harvest no harm." Though certainly a dry August would be more beneficial had a moderately wet July preceded, there is hope still for agricultural prospects, looked at from an exclusively agricultural point of view. In a country like the United Kingdom, which from its insular situation has an atmosphere never utterly destitute of a share of moisture, a state of things such as prevailed before 1884 is alone altogether irremediable. This is the more worth recollecting that the other than purely agricultural grievances of a drought are of an extent to require every consolation which can by any ingenuity be imagined. Want of rain causes innumerable inconveniences, some slight, some considerable, and all most irritating. Water is so entirely a necessity that a dearth of it is resented as an actual cruelty. Englishmen expect to have enough of it to waste as well as use. They cannot endure to be allowanced in respect of water more than of air. In ordinary circumstances, the largeness of the normal British water supply is not in the least appreciated. As soon as it begins to



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fall off, an Englishman recognizes at every turn by a succession of shocks how marvellously unpleasant it is to be stinted. Individuals speedily find themselves personally incommoded in the country and in the smaller centres of population the moment that a drought has declared itself. It is no light matter in a country house to discover that the cisterns are all but empty and to watch the neighbouring stream declining into mud. When a river like the Thames is so exhausted that Bank holiday excursionists afloat incur at all events no danger of drowning, smaller currents may be supposed to have disappeared altogether. In places such as London a drought manifests its effects in a worse though less direct way. Townsmen need rain not merely to supply the water they drink and wash in, but as a master scavenger. Occasional deluges are the sole adequate instruments for cleansing cities like London and Manchester, Glasgow, and Liverpool. After a period of dry weather humanity in masses is as refreshed by a copious downpour as vegetation. The most casual observer cannot walk through the town, its wealthy as much as its squalid quarters, after an interval of good steady rain without a consciousness of a stir and renewal of life. He is no longer afraid to open his nostrils to the breeze. The air has been washed; and he can perceive the effects on the whole population. Should cholera invade the kingdom, it may sincerely be hoped that at any rate it will delay its arrival until the clouds have finally decided to descend. Its attacks will be resisted with a vastly increased probability of success if the land can first have indulged in a plentiful bath. Rain cannot come too quickly both for the purposes of health and for those of agriculture. Except on some early ripening land, rain not abnormally heavy would not hurt the crops, and might swell the ears. For sanitary considerations its prompt advent is all-important. No urban inspector of nuisances approaches it in efficiency. Not merely does it infallibly detect them, but it abates them of its own authority by one and the same act.

"No means have been, or are likely to be, discovered for compelling the clouds to fall, unless at their own good pleasure, or for dispensing with the supplies they bring. Man, however, is not equally helpless in the distribution of their contents. He can so regulate them that the superfluity of one season shall compensate the deficiency of another. When a sufficient period is taken the kingdom can be shown to have just the amount it needs. Unfortunately, the superabundance is a trouble, and not an advantage, when no sufficient arrangements exist for spreading it over the lean dry seasons. Englishmen have been tempted, by the ease with which in general they obtain from nature all the water they need, to take much less pains than less favoured populations about water storage. An Egyptian peasant, if his fancy could be made to comprehend the golden flood which in Great Britain for many months of the driest years is let roll unheeded into the narrow seas, would think a British farmer the most unreasonable of beings for grumbling at a water scarcity in June and July. A proper system of reservoirs would put an end to many of the evils and burdens which rural England sustains from periods of drought like those of 1884 and 1885. Formerly the topic of the national water supply was involved in inextricable obscurity from the absence of statistics. Mr. G. J. Symons has been foremost in dispelling the darkness. He has devoted a laborious life to the scientific collection of the particulars of the British rainfall. He has brought order into the chaos of the past. At the head of an army of reporters of all ranks, from the Speaker and the Secretary of State for War to

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humble clerks, he has rendered it extremely hard for a single shower in these islands to elude his census. His annual summaries of the "Distribution of Rain over the British Isles," as observed at more than two thousand stations, since 1860, compose a library full of the most valuable instruction, both sanitary and agricultural. The volume for 1884 (Stanford and Simpkin, Marshall, and Co.) has just been published, and is of especial interest owing to last year's drought and thunderstorms. In a season like this, when the land is crying out piteously with thirst for the water it let not long ago run in unregarded floods into the sea, Mr. Symons's volumes would be rather melancholy reading, if the superabundance they record did not point to a mode of correcting the defectiveness with which nature is in the habit of balancing it."

[We have been favoured with several valuable letters respecting the drought, which we shall have the pleasure of inserting next month.—ED.]

## THE DROUGHT AT BASLE IN 1884.*

THIS pamphlet is noticeable chiefly for the details which it gives respecting the deficient rainfall of 1884. Dr. Riggenbach begins his remarks by describing it as the driest year since observations were begun in 1864, and as having four inches less rain than that year; in fact the total fall was only 19·40 inches, and as the average (20 years) is 32·25 it was 41 per cent. below the average, there was only one month, September, which had more than the average. Both as regards number of rainy days, and especially as regards quantity, 1884 must be considered as extremely dry, yet (excepting in March) there was no long rainless period during the year.

This long-continued short supply of rain caused a general diminution in wells and streams. The so-called "Hungerbäche" near Riehen and Liestal, which during the recent wet years had been in flood, dried up. Around Pruntrut on the northern slope of the Jura there was great want of water, and in Seltisberg, situated on an isolated plateau, the inhabitants had to buy it. The level of most of the lakes fell considerably; at Rapperswill on the Lake at Zurich, the boats could not get into the harbour. The bed of the Emme at Burgdorf was dry. At Aarburg, the Aar was lower than it had been since 1753.

The following are a few of the leading numerical data.

| *Temperature.* | | *Various.* | |
|---|---|---|---|
| Absolute max. : July 19th | 95°0 | Mean humidity ... ... ... | 80 |
| Mean ,, ... ... ... | 5·88 | ,, cloud ... ... ... ... | 6·3 |
| Yearly mean ... ... ... | 49·9 | Total rainfall ... ... ... | 19·40 in. |
| Mean min. ... ... ... ... | 43·2 | Days with rain ... ... ... | 167 |
| Absolute min. : Dec. 1st ... | 16·7 | Prevailing wind ... ... ... | S.E. |

* Witterunsbericht des Jahres 1884, Von A. Riggenbach. Basel J. G. Bauer, 1885. Excerpt Verhand. d. Naturf. Ges. in Basel VII Theil 3 Heft.

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## DROUGHT AND WEATHERCOCKS.

THERE are probably few who read the above title who can guess why we have chosen it.

The connection does not always exist; some weathercocks are entirely independent of drought or floods, and some are very seriously affected; the former are those which do not carry any of the usual letters N, E, S, W, or which are wholly of metal, and carried on metal or stone supports.

The weathercocks which suffer from drought are those which have the cardinal points indicated by the letters, and which (though themselves of metal) are carried at the summit of a tall pole. The pole, under the influence of sun and drought, splits, and the cracks run *nearly* along its length, but not precisely; they are slightly inclined, and all run parallel; if the drought is prolonged, they become numerous, and, though no *one* crack may be a tenth of an inch, the aggregate amount becomes large. We have ourselves measured one of which the letters were, during the July drought, carried round 44°; the S letter was carried round until it pointed almost exactly S.W. With subsequent moisture the cracks have partly closed, and possibly by November the letter S will be nearly back in its true position, but as to this we have no knowledge.

It is evidently necessary for observers to watch for the occurrence of this somewhat strange error.

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## THE INFLUENCE OF FORESTS ON CLIMATE.

The third number of *Petermann's Mittheilungen* for this year contains an article by Herr A. Woeikof on the influence of forests on climate. The commencement of a scientific investigation of this subject was made when the Bavarian forest meteorological stations were established, and when Prussia, Alsace-Lorraine, France, Switzerland, and Italy followed the example. As a general rule it may be laid down that in the warm seasons, as between forests and places close at hand which are treeless—1. The temperatures of the earth and air are lower in the former; 2. Their variations are less; 3. The relative humidity is greater. After examining observations as to evaporation, Herr Woeikof states that the influence of forests in diminishing evaporation from water and the soil is so great that it cannot be accounted for alone by the lower temperature of the hot months, the greater humidity, or even by the shade. An important influence, which has hitherto been but little appreciated, is the protection from the wind afforded by the trees, and this the writer regards as more important than all the others together in reducing the degree of evaporation. With regard to the influence of forests on rain and snowfall, there is as yet only a single series of observations supplying comparative statistics, and extending over a sufficiently long period. These were taken in the neighbourhood of Nancy, and they show an important influence of forests in increasing the rainfall.

It might appear that the effect of forests on rain in the climate of Central Europe in winter would be small, for the difference between the temperature

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and humidity of the forest and the open is very little, and the quantity of moisture in the atmosphere is small. But the observations show that it is at this time of the year that forests get much more rain. This the writer attributes to the clouds being lower, the resistance which the forest offers to the movement of the air, and to the moist west wind. Forests retain rain by the undergrowths of grass, moss, &c., much better than open ground, and let water off superficially only after a heavy rainfall; the remainder filters upwards slowly, and much of it is used for the evaporation of the trees. Although forests, especially thick luxuriant forests, cannot exist without certain supplies of moisture, yet it is the same to them when the supplies come, for they retain what they get, and use it over a long period. One example of this is the Lenkoran forest on the west coast of the Caspian, where the vegetation is more luxuriant than in any other part of Europe, yet very little rain falls in summer, but the rainfall in autumn and winter is great. The water is stored up by the forest, and is used in evaporation during the heat of summer. Humidity of the atmosphere, however, is not inconsistent with a high temperature, as the Red Sea shows; but in forests the humidity is due to the evaporation of the leaves—in other words, to a process by which heat is converted into work, and hence the coolness.

Herr Woeikof then endeavours to ascertain the influence of forests on the climatic conditions of their neighbourhoods in the western parts of the Old World, between the 38th and 52nd degrees N. latitude, the places selected being in all cases in the open. Thus for the 52nd degree eight stations are taken between Valentia in Ireland on the west and the Kirghiz steppes on the east; for the 50th, Guernsey on the west, Semipalatinsk on the east, and thirteen stations, and so on for each two degrees of latitude to 38°. The general result of the observations in fifty stations in six different degrees of latitude is that in Western Europe and Asia large forests have a great influence on the temperature of places near them, and that by their influence the normal increase of temperature as we travel eastward from the Atlantic Ocean to the interior of the continent is not merely interrupted, but they give places far removed from the coast a cooler summer than those actually on the sea. A striking example of this is Bosnia. An examination of the statistics shows—1. That in Bosnia the summer is 2°·5 to 4°·5 cooler than in Herzegovina; 2, Even on the island of Lissa, in the full influence of the Adriatic Sea, the summer temperature is more than a degree higher than that of Bosnia, which is separated by lofty mountain ranges from the sea. Bosnia owes this comparatively cool summer to its great forests, whilst Herzegovina is almost disafforested. To sum up: forests exercise an influence on climate which does not cease on their borders, but extends over a larger or smaller adjacent region according to the size, kind, and position of forest. Hence man by afforestation and disafforestation can modify the climate around him; but it is an extreme position to hold that by afforestation the waste places of the earth can be made fertile. There are places incapable of being afforested, which would not give the necessary nourishment to trees.—*Nature.*

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## HEAT AND DRYNESS OF JULY 26TH.

*To the Editor of the Meteorological Magazine.*

SIR,—I do not know whether the following thermometer readings are remarkable, but as I fancy it is not often that in England the difference between dry and wet bulb readings amounts to between 18° and 19°, I send them. The 26th was the hottest day we have had here since I began observations in 1882, the next having been the 8th of August, 1884, when the max. was 84°·9. I kept the house comparatively cool by shutting doors and windows and pulling down blinds, and the feeling, when the door was opened to go out, was that of facing a furnace. After 3 p.m. the sea breeze began to have some effect, till the land breeze again set in, as it did immediately after the calm at 6 p.m., and then for a time the air became drier, till radiation began to cause the formation of dew.

The thermometers (by Casella) are fine and sensitive instruments with cylindrical bulbs and long scales, graduated to fifths of a degree so as to be easily read. I have had them some 25 years and they were last verified at Kew in September, 1881, and so I fancy are as correct as can be. They are in a Stevenson's screen placed on a small plot of grass in the kitchen garden, which has the sun all day at this time of year, excepting for a short time after sunrise and before sunset.—Yours very truly,

R. H. BARNES.

*Heatherlands, Parkstone, Dorset, July 27th, 1885.*

*Temperature, &c., at Parkstone, near Poole, Dorset, July 26th,* 1885.

| 26th July, 1885. | Dry Bulb. | Wet Bulb. | Dew Point. | Relative Humidity. | Wind. | | Cloud. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Direction. | Force. | | |
| | ° | ° | ° | | | | | |
| 7 a.m. | 68·2 | 62·9 | 58·7 | 72 | N.N.E. | 1 to 2 | 0 | Dew. |
| 9 ,, | 77·5 | 68·1 | 61·6 | 58 | ,, | ,, | ,, | |
| 11 ,, | 84·4 | 68·2 | 57·5 | 40 | ,, | ,, | ,, | |
| 1 p.m. | 87·1 | 70·1 | 59·2 | 39 | S.S.E. | 1 to 2 | 1 | |
| 1.20 ,, | 85·7 | 67·7 | 56·0 | 37 | ,, | ,, | ,, | |
| 1.25 ,, | 86 4 | 67·5 | 55·3 | 35 | ,, | ,, | ,, | |
| 2.15 ,, | 88·0 | 69·5 | 57·7 | 36 | ,, | ,, | ,, | |
| 3 ,, | 86·7 | 69·1 | 57·7 | 38 | S.S.W. | 1 | 1 | |
| 4.35 ,, | 84·4 | 71·8 | 63·5 | 50 | ,, | ,, | ,, | |
| 6 ,, | 80·8 | 69·9 | 62·5 | 54 | Calm. | 0 | 0 | |
| 7.15 ,, | 76·6 | 63·7 | 54·6 | 47 | N.N.E. | 1 | 0 | |
| 9 ,, | 69·0 | 62·3 | 57·1 | 66 | ,, | ,, | ,, | Slight dew. |
| 11 ,, | 62·7 | 59·3 | 56·4 | 80 | N.N.E. | 0 to 1 | 0 | Slight dew. |

P.S.—Max. in screen, 88°·0; max. in sun: black bulb, 125°·9, bright bulb, 97°·8 (enclosed in glass jacket).

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## ATMOSPHERIC ELECTRICITY.

*To the Editor of the Meteorological Magazine.*

SIR,—Noticing a reference in your current number to the subject of atmospheric electricity, it occurred to me that you might be interested to know of some experiments in that regard which have been tried here. The collecting sources are two—

(1) A long cane carrying a brass ferule armed with three fine platinum points, elevated some 30 feet above the ground, on a building situated near the Observatory.

(2) A tower situated on a rounded eminence, 620 ft. to the N. of the Observatory, its base being 55 ft. above it.

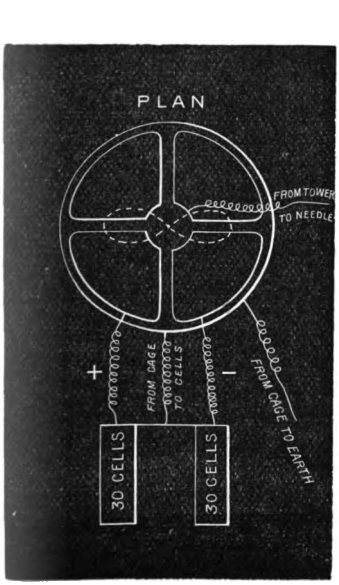
The conducting wires are of copper, gutta percha covered, and are led into the Observatory. The cane on the building is insulated, by being divided by a vulcanite stem protected by a copper funnel, the wire passing inside the upper half.

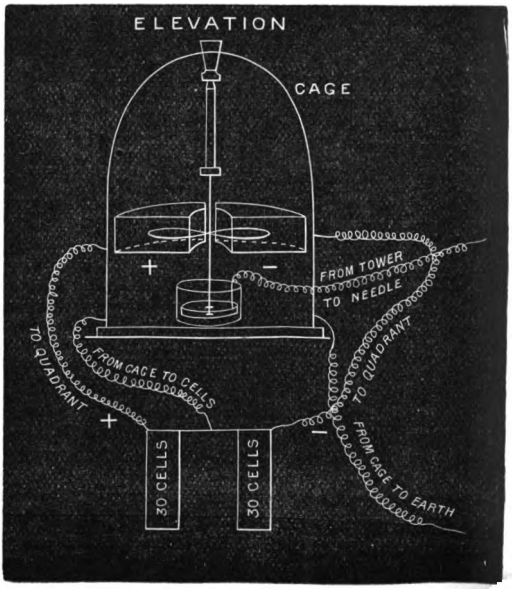
The pole on the tower terminates in a corona of 25 platinum points, and this is insulated by being placed on a glass rod, which runs through a Mascart bottle filled with sulphuric acid. The corona is about 30 ft. above the base of the tower.

The receiving apparatus is of three sorts—

(*a*) A Bohnenberger electrometer composed of a single gold leaf suspended between the opposite poles of two Zamboni's piles.

(*b*) A pith ball electrometer, consisting of two gilded pith balls suspended in contact by fine platinum wires.

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(*c*) A Thomson quadrant electrometer of simple form, in which the ordinary arrangement is reversed, the needle being used to test the wire, while the opposite pairs of quadrants are kept permanently charged by two of De La Rue's chloride of silver batteries of 30 cells each, connected at centre to earth.

The needle carries a mirror, and the deflections are read off on a scale in the usual way. The instruments are usually examined at 9 a.m., and specially as occasion offers.

The Bohnenberger is the most sensitive, and is affected by small currents. The pith balls are used as these are found stronger. The quadrant is employed for measurement of quantity and duration of current. Generally the lower points are found to give stronger indications than those on the Tower, which I attribute to the greater resistance in the longer length of wire.

In calm weather the electricity is usually feeble and Positive. In broken weather Negative electricity is oftener developed; but sometimes the sign changes rapidly. On one occasion at least I have found the upper and lower points of opposite signs simultaneously. As a shower of rain or hail comes on, the current strengthens, and sparks now and then fly from the wires. Once my assistant obtained long ones from the wire, and rapid discharges from a pint Leyden jar, coupled up to it. The quadrant arrangement seems a useful one, as avoiding the need of a "replenisher," and as affording a constant charge; and I have every reason to be satisfied with it.

I have not at present examined and arranged the results obtained since the apparatus has been at work, but I hope to do this shortly in connection with the general meteorological observations taken at the same time. We seldom get heavy storms, as they are apparently broken up by the Hogs' Back and opposite hills; and cases of lightning injury are rare. I have not yet tried a small captive balloon, but probably valuable results might be had by thus extending the exploring height. The observatory (51° 13′ 39″·2 N.; 0° 28′ 47″ W.) faces south on the spur of the Hogs' Back, and is 150 feet above Guildford town, and 250 feet super mare. Booker's Tower is marked on Ordnance Map, B M. 305 ft. 5 in.

J. RAND CAPRON.

*Guildown Observatory, July 18th, 1885.*

## ATLANTIC TIDES AS STORM WARNINGS.

*To the Editor of the Meteorological Magazine.*

SIR,—Supposing that you do not approve of long discussions, I, in reply to Mr. Brenan's rejoinder in last *Meteorological Magazine*, beg merely to remark that I made no reference to, because I do not believe in, *suction* either at sea or in a common pump.

When we get satisfactory proof in favour of the statements advanced in Mr. Brenan's last two paragraphs, I shall be forced to change my views.

HENRY MUIRHEAD, M.D.

*Cambuslang.*

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## THE LONDON THUNDERSTORM OF JULY 13TH.

A very local heavy rain occurred about 9 p.m. on July 13th. We have not heard any evidence proving that the fall could claim an entirely exceptional character, but there can be no doubt that, for a short time, very heavy rain fell. Unfortunately there is no self-recording rain gauge within the City boundaries, and the only one in London is that at Camden Square, two miles and a half N.W. of St. Paul's. There are three ordinary rain gauges in the City, and the total collected by each was as follows :—

St. Luke's, Old Street, E.C., 1·19 in. (the storm lasted from 9 to 9.30 p.m.)
The Guildhall, E.C., 1·24 in.
The Guildhall, E.C., 1·18 in. (this gauge is 51 feet above ground.)

Of non-instrumental records—*i.e.*, verbal statements—the strongest are—"In Queen Victoria Street, E.C., the rain fell faster than the gutters could carry it away, so that even in well-built premises it overflowed the gutters, burst through the roofs, and ran downstairs;" and, "A considerable portion of Farringdon Street, long after the storm, was impassable to foot passengers."

At Camden Square there was a mere shower; the total fall was only ·07 in., and the Casella recording gauge shows that it began at 8.20 p.m., mostly fell before 9, and ceased entirely at 9.15 p.m.

The following list gives such metropolitan records as have been received. Stations in the usual order :—

| | in. | | in. |
|---|---|---|---|
| Lansdowne Crescent, W. ..... | ·02 | Camden Square, N.W..... ..... | ·07 |
| S. Kensington (Inventions Ex.) | ·09 | Camden Road, N. ..... | ·22 |
| Guildhall, E.C. ..... | 1·24 | 58, Clapton Common, N. ..... | ·30 |
| ,, (Roof) ..... .. | 1·18 | Brixton (Acre Lane) ... ..... | ·00 |
| Old Street, E.C ..... ..... | 1·19 | Greenwich (Royal Obs.) ..... .. | ·06 |
| Regent's Park (Roy. Bot. Soc.) | ·24 | | |

## A RAILWAY TRAIN OVERTURNED BY WIND.*

(Wochenschrift des österreichischen Ingenieur- und Architekten Vereins, 13th December, 1884, p. 336.)

A TRAIN consisting of nine vehicles left Vienna at 6.30 a.m. on December 10, 1884, by the Vienna and Auspang line. Near the Biedermannsdorf Station the last four vehicles were blown off the line, and thrown down an embankment 5 yards high; as the coupling gave way the rest of the train remained upon the metals. Three of the vehicles blown off were passenger carriages, and the fourth was a goods van; the former weighing about 8·3 tons each, and the latter about 5·9 tons. The surface exposed to the wind was 161 square ft. in the case of the passenger carriages, and 178 square ft. in the case of the van. The leverage of the wind pressure may be taken at 6 ft. 7 in., which gives 43·2 lbs. per square foot for the passenger carriage and 27·9 lbs. per square foot for the goods van, as the wind-pressure necessary for over-turning. W. B. W.

* Foreign Abstracts. Inst. C.E. 1885.

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## LIGHTNING AND LUMINOUS CLOUDS ON AUGUST 6TH.

*To the Editor of the Meteorological Magazine.*

SIR,—Is it, or is it not, a common occurrence to see lightning rise from the ground to the cloud? On Thursday night last, between half-past nine and half-past ten, we had the grandest display of electricity that I have ever seen; distance, 14 to 31 seconds, or I suppose three to six miles. Twice my daughter and I saw distinctly streams of electricity rise from the ground to the cloud, and another, to me, curious phase was that *several* times a brilliant flash, occurring at the lower edge of a rising ground, extended upwards to the top, and then all along the edge to as far as trees, close to, allowed us to follow it in one continued line of vivid light.

The storm was in front, and on two sides of where we were, that is from nearly E. round by S. to S.W.

I certainly never saw any display of lightning so extensive or so vivid. One flash, I suppose nearer to me than the rest, so dazzled me that I could not read at all that evening.

F. GARTSIDE TIPPINGE.

*Sansaw, Shrewsbury, August 9th, 1885.*

[As regards "upstrokes" they are less often seen than downstrokes, but do occur from time to time. Some electricians say that every flash is double, and starts simultaneously from earth and cloud, but unless our eyes, and all the photographs of lightning flashes, are wrong, that theory is incorrect. Our impression is that upstrokes are rare, but that when they do occur they are very violent.

As regards the luminosity of a length of country, it is curious that Prof. Colladon, of Geneva, observed on the same night that "a long black cloud, stretching from the Dôle to the Galène, presented on each side a broad phosphorescent border, and about 9.15 p.m. there became suddenly visible in that part of the cloud nearest the Jura a luminous centre, whence escaped two or three phosphorescent rays pointing to the S.W."—ED.]

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## LIGHTNING STRUCK OAKS AT RICHMOND, SURREY.

During the thunderstorm of August 6th, two oaks near the White Lodge in Richmond Park were struck by lightning. The occurrence was described in a letter to the *Times*, inserted on September 5th, and as portions of that letter have been reprinted in *Nature*, *The English Mechanic*, and other papers, it is only necessary here to state that good photographs of the damage can be obtained from Mr. A. Seeley, The Ferns, Onslow Road, Richmond.

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# SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ·55 | XI. | Rhayader, Nantgwillt.. | 1·26 |
| ,, | Margate, Birchington... | ·27 | ,, | Carno, Tybrith ... ..... | 1·48 |
| ,, | Littlehampton .. ..... | ·36 | ,, | Corwen, Rhug ..... | 1·09 |
| ,, | Hailsham ..... | ... | ,, | Port Madoc ..... | 3·52 |
| ,, | I. of W., St. Lawrence. | ·70 | ,, | I. of Man, Douglas ..... | 2·33 |
| ,, | Alton, Ashdell..... | ·22 | XII. | Stoneykirk, Ardwell Ho. | 2·41 |
| III. | Winslow, Addington ... | ·37 | ,, | Melrose, Abbey Gate... | 1·36 |
| ,, | Oxford, Magdalen Col... | ·18 | XIII. | N. Esk Res. [Penicuick] | 1·40 |
| ,, | Northampton ..... | ·34 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | ·92 | ,, | Glasgow, Queen's Park. | 1·47 |
| ,, | Wisbech, Bank House.. | ·58 | XV. | Islay, Gruinart School.. | 2·13 |
| IV. | Southend ..... | ... | XVI. | St. Andrews, Newton Bk. | ·74 |
| ,, | Harlow, Sheering ... .. | ·38 | ,, | Balquhidder, Stronvar.. | 2·86 |
| ,, | Rendlesham Hall ..... | ·40 | ,, | Dunkeld, Inver Braan.. | ·79 |
| ,, | Diss ..... | ·72 | ,, | Dalnaspidal H.R.S. ... | 1·04 |
| ,, | Swaffham ..... | 1·10 | XVII. | Keith H.R.S. ..... ..... | 1·32 |
| V. | Salisbury, Alderbury... | ·16 | ,, | Forres H.R.S. ..... ... | ·74 |
| ,, | Warminster ..... | ·18 | XVIII. | Strome Ferry H.R.S.... | 2·76 |
| ,, | Calne, Compton Bassett | ·34 | ,, | Lochbroom ..... | 1·27 |
| ,, | Ashburton, Holne Vic.. | ·69 | ,, | Tain, Springfield..... | 1·11 |
| ,, | Holsworthy, Clawton... | 1·14 | ,, | Loch Shiel, Glenaladale | 5·39 |
| ,, | Hatherleigh, Winsford. | 1·56 | ,, | Invergarry ..... | 2 30 |
| ,, | Lynmouth, Glenthorne. | ·59 | XIX. | Lairg H.R.S. ..... | 1·21 |
| ,, | Probus, Lamellyn ..... | ·46 | ,, | Forsinard H.R.S. ..... | 1·54 |
| ,, | Wincanton, Stowell Rec. | ·26 | ,, | Watten H.R.S. ..... | 1·30 |
| ,, | Wells, Westbury..... | ·61 | XX. | Dunmanway, Coolkelure | 3·18 |
| VI. | Bristol, Clifton ..... .. | ·97 | ,, | Fermoy, Gas Works ... | 1·01 |
| ,, | Ross ..... | ·31 | ,, | Tralee, Castlemorris ... | 1·57 |
| ,, | Wem, Sansaw Hall..... | ·67 | ,, | Tipperary, Henry Street | 1·50 |
| ,, | Cheadle, The Heath Ho. | ·67 | ,, | Newcastle West ..... | 1·28 |
| ,, | Worcester, Diglis Lock | ·19 | ,, | Miltown Malbay..... | 4·26 |
| ,, | Coventry, Coundon ..... | ·03 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | ·11 | XXI. | Carlow, Browne's Hill.. | 1·40 |
| ,, | Ketton Hall [Stamford] | ·17 | ,, | Navan, Balrath ..... | ·72 |
| ,, | Horncastle, Bucknall ... | ·75 | ,, | Mullingar, Belvedere ... | 2·11 |
| ,, | Mansfield, St. John's St | ·54 | ,, | Athlone, Twyford ..... | 3·50 |
| VIII. | Macclesfield, The Park. | 1·79 | XXII. | Galway, Queen's Col.... | 4·50 |
| ,, | Walton-on-the-Hill..... | 1·99 | ,, | Clifden, Kylemore ..... | 6·32 |
| ,, | Lancaster, South Road. | 2·07 | ,, | Crossmolina, Enniscoe.. | 3·81 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 1·69 |
| IX. | Wakefield, Stanley Vic. | ·93 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 1·06 | ,, | Rockcorry..... | ... |
| ,, | Scarborough..... | ·86 | ,, | Warrenpoint ..... | 1·65 |
| ,, | East Layton [Darlington] | ·60 | ,, | Newtownards ..... | 1·75 |
| ,, | Middleton, Mickleton.. | ·77 | ,, | Belfast, New Barnsley . | 2·32 |
| X. | Haltwhistle, Unthank.. | 1·69 | ,, | Cushendun ..... | 1·45 |
| ,, | Shap, Copy Hill ..... | 2·88 | ,, | Bushmills ..... ..... | 1·87 |
| XI. | Llanfrechfa Grange . .... | ·71 | ,, | Stewartstown ..... | 2·33 |
| ,, | Llandovery ..... | 1·86 | ,, | Buncrana ..... | 1·61 |
| ,, | Castle Malgwyn ..... | 1·03 | | | |

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# AUGUST, 1885.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches | inches. | in. | | | | | | | | |
| I. | London (Camden Square) ... | ·85 | — 1·89 | ·25 | 26 | 12 | 79·3 | 17 | 43·3 | 14 | 0 | 0 |
| II. | Maidstone (Hunton Court)... | ·73 | — 1·51 | ·18 | 26 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | Strathfield Turgiss ..... | ·90 | — 1·52 | ·32 | 8 | 6 | 79·4 | 17 | 43·8 | 23 | 0 | 0 |
| III. | Hitchin ..... | 2·39 | + ·11 | ·40 | 12 | 11 | 70·0 | 17 | 39·0 | 13*a* | 0 | ... |
| ,, | Banbury ..... | 2·75 | + ·05 | ·60 | 27 | 14 | 74·0 | 16 | 37·0 | 14 | 0 | ... |
| IV. | Bury St. Edmunds (Culford) | 2·29 | + ·12 | 1·31 | 5 | 7 | 75·0 | 10*b* | 35·0 | 13 | 0 | ... |
| ,, | Norwich (Cossey) ..... | ·64 | — 1·98 | ·16 | 20 | 8 | 75·0 | 10*c* | 37·0 | 15 | 0 | 1 |
| V. | Weymouth(LangtonHerring) | 1·04 | ... | ·40 | 26 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | Barnstaple..... | 1·05 | — 3·05 | ·36 | 6 | 10 | 79·0 | 27 | 45·0 | 4 | 0 | ... |
| ,, | Bodmin ..... | 2·64 | — 2·20 | ·72 | 6 | 12 | 74·0 | 19*d* | 45·0 | 15 | 0 | 0 |
| VI. | Stroud (Upfield) ..... | 2·50 | — ·67 | ·55 | 26 | 13 | 75·0 | 10*e* | 42·0 | 13*f* | 0 | ... |
| ,, | ChurchStretton(Woolstaston) | 3·52 | — ·56 | 1·81 | 4 | 13 | 72·0 | 16*g* | 44·0 | 14*h* | 0 | 0 |
| ,, | Tenbury (Orleton) ..... | 2·87 | — ·85 | 1·18 | 4 | 11 | 78·5 | 17 | 33·3 | 14 | 0 | 1 |
| VII. | Leicester ..... | 2·98 | ... | ·82 | 6 | 15 | 76·0 | 25 | 40·5 | 15 | 0 | 3 |
| ,, | Boston ..... | 1·26 | — 1·35 | ·44 | 7 | 9 | 82·0 | 25 | 42·0 | 14*c* | 0 | ... |
| ,, | Grimsby (Killingholme)..... | 2·29 | — ·63 | ·71 | 20 | 10 | 71·5 | 10 | 41·0 | 14 | 0 | ... |
| ,, | Hesley Hall [Tickhill]..... | 1·39 | ... | ·33 | 6 | 8 | 76·0 | 16 | 36·0 | 15 | 0 | 0 |
| VIII. | Manchester (Ardwick)..... | 1·66 | — 2·26 | ·54 | 12 | 13 | 70·0 | 1*i* | 43·0 | 14*j* | 0 | ... |
| IX. | Wetherby (Ribston Hall) ... | 1·30 | — 1·33 | ·51 | 7 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | Skipton (Arncliffe) ..... | 3·39 | — 2·41 | ·95 | 12 | 12 | 72·0 | 16 | 35·0 | 13 | 0 | ... |
| X. | North Shields ..... | 3·55 | + ·46 | 1·91 | 5 | 12 | 71·5 | 10 | 38·5 | 14*f* | 0 | 0 |
| ,, | Borrowdale (Seathwaite)..... | 8·36 | — 2·68 | 3·25 | 10 | 10 | 73·8 | 1 | 35·2 | 30 | 0 | ... |
| XI. | Cardiff (Ely)..... | 2·79 | — 2·54 | ·72 | 6 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | Haverfordwest ..... | 3·00 | — 1·97 | ·92 | 9 | 12 | 72·2 | 2 | 38·5 | 4 | 0 | 0 |
| ,, | Plinlimmon (Cwmsymlog) ... | 2·71 | ... | ·56 | 9 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | Llandudno..... | ·91 | — 2·28 | ·18 | 5 | 10 | 69·0 | 9 | 44·0 | 15 | 0 | ... |
| XII. | Cargen [Dumfries] ..... | 3·49 | — ·78 | ·74 | 9 | 10 | 74·2 | 1 | 35·0 | 30 | 0 | ... |
| ,, | Jedburgh (Sunnyside)..... | 1·47 | — 1·90 | ·46 | 12 | 9 | 70·0 | 1 | 35·0 | 30 | 0 | 0 |
| XIV. | Douglas Castle (Newmains) | 5·59 | + 1·29 | 1·80 | 3 | 10 | ... | ... | ... | ... | ... | ... |
| XV. | Lochgilphead (Kilmory)..... | 3·79 | — 1·43 | 1·17 | 12 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | Oban (Craigvarren) ..... | 2·10 | ... | ·66 | 10 | 10 | 70·5 | 19 | 42·6 | 27 | 0 | ... |
| ,, | Mull (Quinish)..... | 1·92 | ... | ·43 | 9 | 9 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices ..... | 3·10 | — ·98 | 1·10 | 8 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | Arbroath ..... | 1·52 | — 1·81 | ·40 | 9 | 9 | 71·0 | 21 | 39·0 | 14 | 0 | ... |
| XVII. | Braemar ..... | 4·96 | + ·53 | 3·44 | 12 | 12 | 73·0 | 1 | 29·1 | 31 | 1 | 5 |
| ,, | Aberdeen ..... | 2·02 | ... | ·92 | 12 | 16 | 70·0 | 16 | 33·0 | 30*k* | 0 | ... |
| XVIII | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | Culloden ..... | 1·89 | — 1·11 | ... | ... | ... | 69·0 | 1 | 33·0 | 31 | 0 | 5 |
| XIX. | Dunrobin ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | Orkney (Sandwick)..... | 1·68 | — 1·22 | ·58 | 10 | 16 | 62·5 | 9 | ... | ... | ... | ... |
| XX. | Cork (Blackrock)..... | 4·46 | + ·63 | 1·37 | 27 | 13 | 88·0 | 17 | 40·0 | 20 | 0 | ... |
| ,, | Dromore Castle ..... | 2·98 | ... | 1·00 | 8 | 10 | 77·0 | 20 | 45·0 | 23 | 0 | ... |
| ,, | Waterford (Brook Lodge) ... | 4·63 | ... | ·77 | 27 | 13 | 75·0 | 18 | 40·5 | 20 | 0 | 1 |
| ,, | Killaloe ..... | 3·46 | ... | ·93 | 27 | 13 | 77·0 | 1, 2 | 40·0 | 14 | 0 | ... |
| XXI. | Portarlington ..... | 2·63 | — ·44 | ·51 | 6 | 15 | 78·0 | 1 | 39·0 | 14 | 0 | ... |
| ,, | Dublin (FitzWilliam Square) | 3·05 | — ·13 | 1·72 | 4 | 14 | 71·4 | 17 | 41·2 | 14 | 0 | 0 |
| XXII. | Ballinasloe ..... | 2·38 | — 1·65 | ·72 | 30 | 11 | 72·0 | 1 | 33·0 | 14 | 0 | ... |
| XXIII | Waringstown ..... | 1·44 | — 2·00 | ·51 | 5 | 12 | 82·0 | 1 | 40·0 | 13 | 0 | 0 |
| ,, | Londonderry (Creggan Res.). | 2·18 | ... | ·64 | 12 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | Omagh (Edenfel) ..... | 1·44 | — 2·21 | ·27 | 5 | 13 | 75·0 | 1 | 40·0 | 13 | 0 | ... |

ENGLAND. WALES. SCOTLAND. IRELAND.

*a* And 14. *b* And 16, 17, 25. *c* And 15. *d* And 20. *e* And 16, 25. *f* And 30. *g* And 25. *h* And 15, 30. *i* And 10, 16, 24. *j* And 15, 19. *k* And 31.

+ Shows that the fall was above the average : — that it was below it.

# METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Altogether a very fine and dry month, though the nights were cold, prolonging the later harvest. Hops in this county an almost total failure; autumn growth of grass checked by the cool temperature; keep scarce; root crops unfavourable; potatoes not so good as last year; hay crop very good; no T or L all the month.

HITCHEN.—The coldest August on record.

BANBURY.—A rather favourable month for harvest work, but R too late to be of much use to grain; crops hardly so good as was expected. Mean temp., 55°·9; T S S on 6th; H on 7th; high wind on 12th and 28th.

COSSEY.—A cold, dry month, the temp. rose to 70° on only five days; wheat harvest commenced on 10th, and all corn was secured by 31st.

LANGTON HERRING.—Another very dry month, rainfall 1·69 in. below the average of ten years; from June 25th to August 25th inclusive (62 days) the rainfall was only ·54 in., the average for the corresponding 62 days of ten years being 5·16 in. Mean temp. more than 2° below the average of 13 years, and the lowest for August in that period. Distant T on 6th, 7th, and 23rd, but no T S here this summer; heavy dew on 25th; high wind on 26th.

BODMIN.—Magnificent weather during the whole month. Mean temp., 59°·8.

STROUD.—Unsettled weather till 12th, and cold towards the end of the month. L on 6th, T S on 7th, high wind from S.W. from 8th to 12th.

WOOLSTASTON.—A favourable month for the harvest; mean temp., 55°·8. The rainfall of the 4th was the heaviest recorded here during 20 years. T and L on 6th.

ORLETON.—With the exception of a few days about the 16th, the temp. was uniformly low with a prevalence of cold, clear nights and fine days. Mean temp. nearly 4°·5 below the average of 24 years, and more than 2° lower than that of 1862, the lowest in that period; pressure generally high and steady; prevailing winds N. and E.; prolonged T S and ·58 in. of R on 6th; frost on grass on 14th.

LEICESTER.—Cold for the time of year; T S on 5th; T S with H on 6th.

KILLINGHOLME.—The month was cold, owing to the prevalence of polar winds; moderate rains saved the root crops and did not injure the corn; harvest made rapid progress, but wheat did not yield according to promise. T and L on 6th and 7th; distant T on 12th.

MANCHESTER.—The month although fine on the whole was remarkably cold; a few miles from Manchester there were frosts on two separate occasions during the month, and even at Ardwick, which is well within the influence of the city, the temp. was on three occasions as low as 43°; only one slight T S.

SEATHWAITE.—Stormy on 9th and 10th, with 5·42 in. of R in the two days.

## WALES.

HAVERFORDWEST.—The weather continued fine and warm until the 6th, on which day the air was cold early (wind S.E.), and large masses of rocky cumulus were aggregating. About noon the appearance was very threatening, a bank of cloud of intense blackness extending from E N.E. to N.W.; this developed into a circular storm of great intensity, with very vivid forked L of a remarkably fine rose colour. In this immediate neighbourhood the storm culminated about 7 p.m., when a terrific flash of rose-coloured L occurred, followed by a deafening peal of T, and ·50 in. of R in half an hour. Broken weather prevailed from 11th to 13th, from which date to the end of the month it was warm and fine. A grand harvest month, splendid corn crops, green crops also very good. Mean temp. below average, 70° being reached on only six days.

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LLANDUDNO.—A dry and bright month, but owing probably to the prevalence of polar winds, particularly towards the end of the month, the mean temp. was no less than 3°·8 below the average; the monthly range 6°·1, and the daily range 2°·9, were also below the average; 173 hours of bright sunshine were recorded.

## SCOTLAND.

CARGEN.—Mean temp. 3°·6 below the average; the coldest summer observed here for 25 years, the mean temp. of the months May, June, July, and August being 3°·1 below the average. Most of the corn was cut in this district by the end of the month; T and L on 6th and 7th; gale on 10th.

JEDBURGH.—The month was marked by cold E. and N.E. winds, and a total absence of R during the latter half. Potato crop so far remarkably good and free from all disease; cutting of grain crops quite general during the latter half of the month; barley above the average, oats an average crop; springs and rivers remarkably low; great absence of sunshine.

KILMORY.—The weather was remarkable for the alternation in character of both temperature and wind. The heat of the sun on the afternoon of 21st was extraordinary, indeed during the latter half of the month the amount of sunshine was such as is very unusual in this locality. Barley and some oats cut, and harvest will be general at the beginning of September. Heavy R (·97 in.), and strong S.S.E. wind on 10th.

QUINISH. — Frost on night of 27th, blackening potatoes and French beans.

BRAEMAR.—A dry but very cold month, with prevalent E. wind. On the night of the 12th the mountains were covered almost to their base with S, this not having been seen before in August by the oldest inhabitant; 3·44 in. of R fell here on that day, the heaviest fall recorded during 29 years' observations.

ABERDEEN.—Fine month; rainfall below the average.

CULLODEN.—Very dry, with temp. below the average; the grass temp. falling on the night of the 31st to 25°·2; the potato crop considerably damaged.

## IRELAND.

BLACKROCK.—1st and 2nd fine, then showery to 12th, followed by very fine and often hot weather to 25th, then showery to the end. It is notable that twice in the month more than an inch of R fell in 24 hours, which very seldom occurs here in any one month, viz., 1·36 on 8th, and 1·37 on 27th.

DROMORE.—The month was everything that could be desired.

WATERFORD.—Rainfall ·88 in. above the average of 25 years; T on 4th and 5th; S.W. gale on 9th and 10th; fog on 16th, 25th and 26th.

KILLALOE.—With some heavy showers in the first and closing weeks of the month, a period of fully a fortnight of brilliant weather enabled hay harvesting to be finished in fine condition.

DUBLIN.—A very cool, changeable month, and an unusual preponderance of winds from "polar" quarters. More than half the rainfall (56 per cent.) was measured on 4th, and the rainy days were only 14, compared with an average of 15·5. There was H on 4th and 12th, and electrical disturbances occurred near Dublin on 4th and 7th. The atmosphere was foggy on 24th, 25th and 26th, and frequently hazy during the latter part of the month. Mean temp. 55°·9, 3°·0 below the average of 20 years, and lower than that of any August in that period, the nearest approach being in 1881, when the mean temp. was 56°·0. Mean humidity, 83; prevailing winds, E.N.E. and N.

WARINGSTOWN.—The R of the first and second weeks, though it did much good, was insufficient to affect pastures to any great extent, and during the last fortnight the grass was much burned up, and a water famine was imminent.

EDENFEL.—Another "old-fashioned" summer month, calm, generally clear and occasionally hot, with a rainfall considerably less than half the average. The somewhat remarkable sequel of a late harvest has followed this charming summer, and even now (September 4th) five-sixths of the cereals are unreaped, and the potato haulm is quite as green as ordinarily in July, and the tubers more free from disease than in any year since 1845.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXVII.] OCTOBER, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE RAINBAND VINDICATED.

IT is now some four years since that in the pages of the *Meteorological Magazine* I essayed to give a popular character to a comparatively unknown branch of science in my "Plea for the Rainband."

Has this plea been successful, and has the rainband vindicated its position as a weather prognostic? I venture to think that both these questions may be answered in the affirmative. Soon after the publication of the article, I was requested by a well-known optician to permit a reprint of it as a companion to the spectroscope, and before long many copies of it were distributed amongst meteorologists and others. This brought the matter before the public, and not long after rainband spectroscopes, pamphlets, and discussions showed that a keen interest was felt in the subject.

Of course, as in the case of all other new objects, the first rush for information and possession by and by passed, and the interest in it to a certain extent subsided. I have recently found, however, from enquiries and correspondence addressed to me, that this, though diminished, has by no means died out. I propose, therefore, to justify what the "Plea" advanced by shortly stating the subsequent progress of rainband spectroscopy to the present time.

The impetus given to the enquiry may be recognized in three ways: by (1) its recent literature; (2) the increased use of the spectroscope as a meteorological adjunct; and (3) recorded observations and their results.

### THE RECENT LITERATURE.

In taking up the first subject, the recent literature of the rainband, I propose to deviate somewhat for the purpose of introducing an interesting early notice of it which escaped my attention when writing my "Plea," and which it would be unjust now to omit. It dates back as far as 1869, and will be found in the *Meteorological Magazine* for July and October of that year, vol. iv. Nos. xlii. and xlv., "The indications of the sky." The first part of this article describes and figures Saussure's cyanometer and its mode of use, and then after quoting Kaemtz on the blue colour of the air comes the



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following passage :—"In spite of ourselves the above extract has led from the original subject of this article, the cyanometer, to what must, we presume, be held to be its legitimate successor, the spectroscope." The second part of the article treats of the spectroscope and its advantages to meteorologists, and by an extract from the British Association Report for 1868, "Observations on the atmospheric lines of the solar spectrum in high latitudes, by George Gladstone, F.C.S., F.R.G.S.," it points out the distinction between "atmospheric" and "solar" lines, and shows how these former are always most prominent with a low sun, while scarcely visible with a high one. Also that the red end of the spectrum varies under similar circumstances in length and brilliancy. Prof. Roscoe's "Spectrum Analysis" is quoted, a figure of a pocket spectroscope (reproduced here) is given,

*Fig. 1.*

and the article ends thus :—"No one can tell what secrets lie hid in these atmospheric lines, but to us it seems that by their careful and systematic observation the 'Message from the Stars' which has taught us so much may be rivalled in practical importance by a 'Message from the Sky.'"

This prediction may not have caught the full import and meaning of the atmospheric bands and lines, but at least it forecasts the value they subsequently attained in meteorology.

Passing from this, we will refer to a correspondence in the *Times*, which took place in the latter part of 1882, and in which both sides of the question were jealously advocated. Prof. C. Piazzi Smyth here pens a series of letters in favour of the rainband. In one of these he states he saw a spectroscopic rainband, "the blackest and most intense of the season," and "destructive floods followed." As the rainband cleared away, "magnificent harvest days followed." Mr. Ralph Abercrombie sees no value in the rainband, and pins his faith upon "isobaric lines," and the forecasts of the Meteorological Office derived therefrom. The Duke of Argyle in a yachting cruise could not see that the rainband had any predictive value, and thinks Prof. Smyth's case was a "good shot." Per contra, Mr. Cory, F.M.S., contends for the value of the rainband, and gives reports of a series of observations proving his case. Agricultor (in the *English Mechanic*) "has been much struck by the accuracy with which the rainband appearance predicts coming rain."

Mr. Abercrombie's isobars are most amusingly discounted by Sir Edmund Beckett in a letter containing a long list of official weather

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prophecies and their want of fulfilment, and recommending "a return to Zadkiel." In June, 1883, my weekly weather report to the *Surrey Advertiser* contained the following:—"Of these rainfalls, the only indication was the rainband, the barometer throughout standing fairly high (between 29·84 in. and 29·99 in.)" Thus the public prints not only took an interest in, but on the whole supported the rainband theory.

As observers and observations increased, more solid literature was developed, including:—*Nature*, vol. xxvi., pp. 552-4, "Spectroscopic Weather Discussions," by Prof. C. Piazzi Smyth, in which the whole subject is reviewed in a condensed form with instructions to observers, and illustrated by two diagrams of the D part of the solar spectrum under considerable dispersion, the one taken in August, 1882, under moist air conditions, and the other on September 4th, 1882, after a whole week of very dry weather. In this article it is shown that, apart from the spectroscope, the wet bulb difference only slightly indicated the sweeping away which took place in September of the water vapour details shown in the August spectrum. On another occasion Prof. Smyth defended the rainband, *Nature*, vol. xxix., p. 525, "Rainband spectroscopy attacked again." In an essay read before the Phil. Society of Washington, and printed in the *American Journal of Science*, the writer of it referred to the "unsatisfactory evidence" of the rainband, because "if the spectroscope is first turned to the sky in any direction, and afterwards to a white wall fifty feet distant, it will be found impossible to distinguish between the appearance of the rainband, as shown by the whole atmosphere, and by the layer fifty feet thick."

The Professor disposes of the objection by promptly pointing out that "the white wall reflects the light and sky spectrum solar lines, and telluric lines and all!"

Of the books and articles published, the following were kindly sent me by the authors:—

"The Science Monthly," illustrated, for December, 1883. "The Hygro-Spectroscope (or Rainband Spectroscope)," by F. W. Cory, F.R.Met.S., with illustrations of a spectroscope and a rainband spectrum.

"How to foretell the weather with the pocket spectroscope," F. W. Cory (Chatto and Windus, 1884); 86 pages, and 10 illustrations of instruments, charts, &c. The Appendix contains the September, 1882, *Times* correspondence in full.

"Observations of the Rainband from June, 1882, to January, 1883," by Hugh Robert Mill, B.Sc., communicated by Prof. Tait to the Proceedings of the Royal Society of Edinburgh, with a chart.

"The Rainband: How to observe it, and what to expect from it," by Hugh Robert Mill. Hilger, 1883. With four figures and a chart.

In the above papers and volumes are contained much useful instruction in the use of the spectroscope, and valuable tables and statistics of rainband results, some of which are referred to later on.

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## THE INCREASED USE OF THE SPECTROSCOPE.

The increased use of the spectroscope quickly followed the publication of the "Plea."

Mr. Browning, at my suggestion, prepared a "standard" instrument, in which was represented a spectrum, as nearly like as possible that figured in the frontispiece to the "Plea."

In this instrument was introduced what I considered for the special purpose an improvement, viz., a fixed slit. This showed the lines about as wide as in the plate, and in a series of observations secured their correspondence.

THE STANDARD SPECTROSCOPE.

*Fig. 2.*

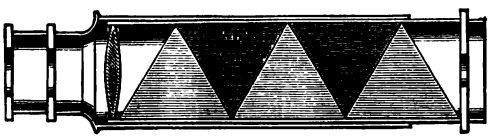

*Fig. 3.*

Of course many other opticians soon began to supply "rainband spectroscopes," but these varied considerably in power and dispersion, and thus did not realize what was my idea of uniformity of observation. I do not wish to specially recommend any maker, but I think it really would be of great advantage if the Royal Meteorological Society or some other competent tribunal would define the width of slit, dispersion of prisms, and the magnifying power to be used. Every observer who has tried several spectroscopes knows how the appearance of the rainband varies according to these incidents.

*(To be continued).*

## Robert Beckley.

In Robert Beckley has passed away one of the best, if not actually the best, mechanic ever occupied with the construction of the heavier class of meteorological instruments.

As mechanical assistant at Kew Observatory, he was at once in the position most accordant with his own wishes, and most useful to science.

It would be tedious to enumerate all the improvements which he suggested—those who knew him best, know best his rare skill, but to meteorologists of all countries the excellence of the Beckley pattern of the Robinson anemometer will be a sufficient indicator of his skill.

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## THE LUMINOUS CIRRUS CLOUD OF JUNE AND JULY.

*To the Editor of the Meteorological Magazine.*

SIR,—Seeing the mention on p. 96, of the singular and very brilliant cirrus clouds visible on several occasions during June at Dublin, I write to say that I witnessed a similar phenomenon at Kissingen (Bavaria), on June 8th and 10th, and July 7th. A letter in *Nature*, of July 16th, describes their appearance, as seen at Southampton on the 6th of that month; and they were observed on the same evening from Blackheath.

It was evident to me (at Kissingen) that the sun was shining on them, and they were so thin as to become quite invisible when the sun ceased to illuminate them; but I did not see these clouds at all before sunset, and cannot say whether they existed then.

The colouring of the upper part was pale steel blue, gradually changing through a dull green to yellow and orange below, varying a little on the three evenings, and at different times. The phenomenon was extremely striking at so late an hour, the mode in which the clouds reflected the light reminding me of the unusual iridescent clouds so widely remarked on a few days last December; but both the colours and the kind of cloud were different.

As the dates of the displays at Dublin are not given, I am unable to decide whether I was viewing the same sheet of cloud at Kissingen; but the one day difference of date of my observation in July, from that in England, would probably be no more than the time required for it to traverse the intervening distance.—Yours truly,

T. W. BACKHOUSE.

*Sunderland, 10th Sept., 1885.*

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## SEPTEMBER FROSTS.

*To the Editor of the Meteorological Magazine.*

SIR,—The following minimum and mean temperatures recorded here on a Glaisher stand are very remarkable:—

| | Min. | Mean. |
|---|---|---|
| 26th September, 1885 ... ... ... | 31°·7 ... | 42°·8 |
| 27th ,, ,, ... ... ... | 28 ·8 ... | 38 ·9 |

My only September readings during the last 17 years at all comparable with these are:—

| | Min. | Mean. |
|---|---|---|
| 22nd September, 1872 ... .. ... | 32°·0 ... | 44°·5 |
| 23rd ,, ,, ... ... ... | 30 ·5 ... | 46 ·0 |
| 15th ,, 1882 ... ... ... | 30 ·6 ... | 47 ·3 |

but the mean (38°·9) of the 27th inst. is not only considerably lower than these, but 1°·8 below that (40°·7) of 28th September, 1824, given in Mr. Glaisher's tables as the lowest September temperature in the past 60 years.—Yours faithfully, PERCY BICKNELL.

*Foxgrove, Beckenham, Sept. 30th, 1885.*

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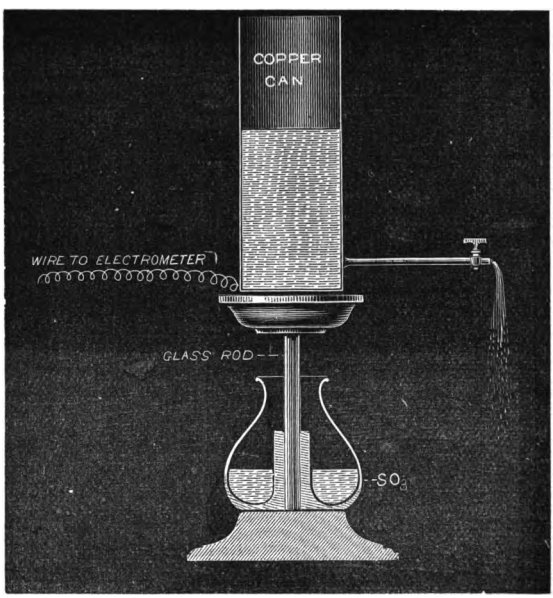
## ATMOSPHERIC ELECTRICITY.

*To the Editor of the Meteorological Magazine.*

SIR,—In continuation of my former letter, and before stating the "results," I wish to describe another way of collecting electricity from the air which has been adopted. This consists of a copper can about six inches across and eighteen inches high, and containing some two gallons of water. This is furnished with a long tube or spout, ending in a brass tap with a small aperture. It is placed on a Mascart insulating stand, and connected with the electrometers by a copper wire. As soon as the tap is turned on, and the water issues from it, the can at once becomes charged with electricity of the same sign as the surrounding air. The effect is greatest when the stream is broken into drops in its fall. This apparatus was found to give, at 15 ft. above ground, deflections of 5° and 10° with the quadrant electrometer, when both sets of points gave no signs of charge whatever. At another time, and when only 4 ft. from the ground, it afforded results, the air being so damp that it was difficult to excite the electrophorus, with which the quadrants were at that time charged. It is thus very sensitive, and at the same time portable.




The general observations have been hardly numerous enough to warrant the assertion of fixed laws, but they seem to establish the following facts pretty satisfactorily :—

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(1) The wind is evidently a strong excitant of electricity. One bright morning, as gusts of wind swept across an outside insulated brass plate, each gust was accurately repeated by a beat of the gold leaf suspended in the Bohnenberger electrometer.

(2) As a rule, though not without exception, the mornings marked "blue sky" showed feeble positive electricity. The exceptions seemed to have occurred lately, when much morning mist has prevailed, and the hygrometer has stood high.

(3) Clouded and damp mornings, though also with exceptions, have yielded the negative sign.

(4) Storms (with one exception) have always given a strong negative sign as they approached the "points." As snow or rain fell, this changed to positive, and in several instances there was a change back to negative before the indications ceased. The exception was a storm on the 24th of July, 1884, at 8.30 p.m., after a fine day, when the sign was first positive, then negative, and ultimately positive again. On rain or snow falling, the electrical conditions in these cases, became very marked, sparks flying from the ends of the conducting wires, the pith balls diverging widely, the mirror deflections amounting to 80°, and the gold leaf being torn away or broken up.

(5). Probably strata opposite in sign may co-exist at different elevations above the earth's surface. Thus on December 6th, 1883, at 10 a.m., a snow-storm coming on, the tower points were strongly negative, but the points near the observatory were charged positively, and this persisted for a quarter of an hour.

(6). The observations do not show with any certainty whether the quantity of electricity varies with the height of the points above the observatory. Five instances are, however, marked "from the tower only," and two "from the lower points only." The tower current has at times been the stronger. Generally it is the weakest, but this I attribute to the resistance of 300 feet of wire, which complete its connection with the receiving apparatus.

From what I have described, it will be seen that periodic observations of atmospheric electricity are possible with simple and inexpensive apparatus. Where expense is not an object, it would be easy to convert these into self-recording forms (as at Greenwich), and thus obtain a continuous and more valuable series of observations.

J. RAND CAPRON.

*Guildown Observatory, August 9th, 1885.*

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# ON THE CLIMATE OF THE BRITISH EMPIRE DURING 1884.

The Annual Climatological Table which we have now published in exactly the same form for some years, scarcely needs any introduction. The number of stations shows a slight increase over the number available for 1883, but Barbados, which is usually prominent, owing to its peculiarities of climate, is absent, the return for one month having failed to reach us. Malta appears for the first time.

The unenviable extremes noted in the following summary are distributed over somewhat different stations than those appearing last year, though Adelaide heads the list for extreme heat. Winnipeg has resumed its old place for the other extreme of cold, and Colombo takes the place of Barbados for uniformity of temperature while still appearing with the greatest total rainfall. The two extremes for which Malta appears — least amount of cloud and smallest rainfall—are certainly not unenviable as far as personal comfort is concerned.

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## SUMMARY.

**Highest temperature in shade, 110°·2, at Adelaide, on January 13th.**
**Lowest temperature in shade, —44°·5, at Winnipeg, on January 3rd.**
**Greatest range in year, 133°·0, at Winnipeg.**
**Least range in year, 24°·6, at Colombo, Ceylon.**
**Greatest mean daily range, 22°·4, at Winnipeg.**
**Least mean daily range, 10°·4, at Colombo, Ceylon.**
**Highest mean daily temperature, 80°·3, at Colombo, Ceylon.**
**Lowest mean daily temperature, 29°·7, at Winnipeg.**
**Driest station, Adelaide; mean humidity, 57.**
**Dampest station, Winnipeg; mean humidity, 82.**
**Highest temperature in sun, 169°·3, at Adelaide.**
**Lowest temperature on grass, —22°·0, at Toronto.**
**Greatest Rainfall, 82·14 inches, at Colombo, Ceylon.**
**Least rainfall, 17·97 inches, at Malta.**
**Most cloudy station, Toronto; average amount, 6·5.**
**Least cloudy station, Malta; average amount, 3·3.**

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# CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1884.

| Station. | Absolute. | | | | Average. | | | | | Absolute. | | Total Rain. | | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | Max. | Min. | Mean. | Dew Point. | Humidity. | Max in sun. | Min. on grass. | Depth. | Days. | Cloud. |
| | Temp. | Date. | Temp. | Date. | | | | | | | | | | |
| England, London. | 92·0 | August 11 | 25·3 | November 25 | 59·3 | 43·6 | 51·5 | 44·0 | 78 | 125·4 | 21·4 | 20·34 | 150 | 6·2 |
| Malta ..... | 94·6 | July 19 | 41·2 | February 23 | 70·9 | 58·8 | 64·9 | 56·2 | 77 | 149·0 | 36·0 | 17·97 | 68 | 3·3 |
| *Mauritius* ..... | 86·0 | Jan. 9, Dec. 19 | 54·1 | August 22 | 79·4 | 68·2 | 73·8 | 64·3 | 75 | 138·5 | 46·2 | 45·80 | 174 | 5·4 |
| Calcutta ..... | 103·7 | April 14 | 50·0 | February 11 | 85·9 | 69·9 | 77·9 | 69·1 | 78 | 163·6 | 37·6 | 62·61 | 116 | 4·2 |
| Bombay ..... | 92·4 | April 4 | 61·6 | Jan. 29, Feb. 1 | 85·2 | 73·7 | 79·5 | 71·1 | 76 | 149·9 | 49·0 | 75·44 | 110 | 3·7 |
| Ceylon, Colombo. | 93·4 | February 19 | 68·8 | Jan. 24, Feb. 4 | 85·5 | 75·1 | 80·3 | 71·7 | 75 | 150·0 | 59·0 | 82·14 | 159 | 5·7 |
| *Melbourne* ..... | 100·7 | February 13 | 33·0 | August 1 | 66·8 | 48·7 | 57·8 | 46·6 | 71 | 158·0 | 24·5 | 25·85 | 128 | 6·2 |
| *Adelaide*..... | 110·2 | January 13 | 35·2 | July 23 | 71·4 | 53·0 | 62·2 | ... | 57 | 169·3 | 26·5 | 18·74 | 138 | 5·0 |
| *Wellington* ..... | 79·0 | February 23 | 32·0 | August 7 | 59·9 | 47·9 | 53·9 | ... | ... | 145·0 | 29·0 | 65·11 | 167 | .. |
| *Auckland* ..... | 77·5 | January 9 | 37·0 | June 1 | 63·4 | 51·8 | 57·6 | 48·4 | 72 | 149·0 | 27·0 | 38·07 | 203 | 6·1 |
| Jamaica, Kingston | 92·7 | September 18 | 62·3 | February 7 | 86·3 | 70·7 | 78·5 | 70·5 | 79 | .. | ... | 26·24 | ... | 4·8 |
| Toronto ..... | 89·6 | August 19 | —13·3 | December 19 | 51·9 | 34·9 | 43·4 | 37·7 | 76 | 148·0 | —22·0 | 28·55 | 182 | 6·5 |
| Fredericton ..... | 92·7 | June 29 | —34·5 | January 29 | 50·2 | 28·7 | 39·4 | 34·0 | 78 | ... | ... | 53·97 | 188 | 6·0 |
| Winnipeg ..... | 88·5 | June 22 | —44·5 | January 3 | 40·9 | 18·5 | 29·7 | 29·2 | 82 | ... | ... | 24·13 | 113 | 5·5 |

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1885.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | 0–10 |
| England, London | 57·8 | 12 | 27·6 | 21 | 49·9 | 38·7 | 39·4 | 83 | 79·2 | 20·8 | 2·86 | 18 | 6·6 |
| Malta | 73·5 | 22 | 42·2 | 15 | 62·8 | 51·1 | 48·8 | 80 | 126·0 | 37·4 | ·33 | 5 | 3·1 |
| Cape of Good Hope | 94·0 | 8 | 51·5 | 4 | 81·2 | 60·7 | ... | ... | ... | ... | 2·12 | 6 | 2·3 |
| *Mauritius* | 86·7 | 1 | 68·8 | 15 | 84·7 | 74·3 | 70·6 | 77 | 139·1 | 63·3 | 2·16 | 14 | 6·0 |
| Calcutta | 85·0 | 28 | 51·7 | 21 | 79·0 | 59·9 | 58·5 | 72 | 144·7 | 40·2 | 2·02 | 8 | 3·7 |
| Bombay | 83·8 | 19 | 60·6 | 11 | 80·3 | 65·3 | 60·5 | 65 | 138·6 | 48·4 | ·00 | 0 | 1·0 |
| Ceylon, Colombo | 95·8 | 22 | 70·4 | 5 | 88·0 | 72·8 | 69·1 | 68 | 148·5 | 63·8 | ·75 | 3 | 4·9 |
| *Melbourne* | 101·6 | 5 | 46·1 | 3 | 76·9 | 55·2 | 52·4 | 67 | 157·6 | 37·9 | 2·74 | 8 | 6·2 |
| *Adelaide* | 103·8 | 4 | 50·7 | 8 | 80·6 | 61·1 | 50·5 | 48 | 157·2 | 41·0 | ·91 | 7 | 4·8 |
| *Wellington* | 76·0 | 14 | 49·0 | 6 | 69·1 | 55·4 | ... | ... | 146·0 | 44·0 | 1·92 | 7 | ... |
| *Auckland* | 79·0 | 14 | 54·0 | 5 | 74·2 | 57·9 | 53·5 | 64 | 149·0 | 43·0 | ·17 | 3 | 4·4 |
| Jamaica, Kingston | 86·9 | 21 | 65·8 | 20 | 84·0 | 68·7 | 69·8 | 84 | ... | 53·3 | ·01 | 1 | 2·3 |
| Barbados | 80·0 | 6a | 65·0 | 12 | 78·0 | 69·0 | 69·0 | 79 | 142·0 | ... | 2·12 | 9 | 5·0 |
| Toronto | 36·6 | 10 | —14·9 | 2 | 19·2 | 0·1 | 10·0 | 82 | 110·0 | —19·0 | 1·82 | 13 | ... |
| New Brunswick, Fredericton | 37·9 | 10 | —23·2 | 12 | 23·6 | — 3·2 | 9·0 | 87 | ... | ... | 3·47 | 10 | 4·8 |
| Manitoba, Winnipeg | 36·7 | 27 | —42·5 | 9 | 3·0 | —19·4 | — 0·5 | 87 | ... | ... | ·44 | 8 | 4·3 |
| British Columbia, Victoria | 58·0 | 19 | 27·0 | 22 | 49·5 | 38·8 | ... | ... | ... | ... | 3·84 | 16 | ... |

a And 7, 19

### Remarks, February, 1885.

Malta.—Mean temp. 56°·0; mean hourly velocity of wind 11·3 miles; sea temp. fell to 58° on 15th, but rose again to 62° on 21st, remaining at that point to the close of the month; H on 10th. J. Scoles.

*Mauritius.*—Rainfall 2·83 in. below and mean temp. 0°·4 above the average; mean hourly velocity of wind 2·5 miles below average; extremes 22·6 miles and 1·9 miles; prevailing direction E. to E. by N. T and L on six days, L alone on six. Very heavy sea on 24th and 25th from N. and N.W. C. Meldrum, F.R.S.

*Melbourne.*—Rainfall ·79 in., and amount of cloud ·9 above average; mean temp. of air 1°·4, and of dew point 0°·8 below average; mean humidity slightly above, and pressure slightly below average. Prevailing winds S. and W., strong on four days. TS8 on 12th and 18th; T on three days, L on two. R. L. J. Ellery, F.R.S.

*Adelaide.*—Mean min. temp. only 0°·8 below the average; but mean max. 2° lower than any previously recorded for February, and nearly 6° below the average of 28 years; the temp. reached 90° on only five days. The mean amount of cloud was in excess of any previous record, being about equal to the midwinter average. C. Todd.

*Wellington.*—First three days dull and showery, with strong N.W. winds; from 5th to 23rd, fine bright and warm, with heavy dews at night and moderate winds, except on the 9th, 10th and 11th, when it blew strongly from N.W.; 24th to 26th, dull and showery; 27th and 28th fine and bright; on the whole a pleasant seasonable month. Rainfall little more than half the average; mean temp. slightly below and pressure slightly above the average; slight earthquake on 19th. R. B. Gore.

*Auckland.*—Remarkably fine and dry throughout, with light variable winds; rainfall the lowest yet recorded for the month. T. F. Cheeseman.

Jamaica.—The rainfall over the whole island was only one half the average, and the drought was severely felt over the greater part. Maxwell Hall.

Barbados.—Mean temp. (73°) average; rainfall 41 per cent. below average. Prevailing wind N.E., mean hourly velocity 15 miles, being 30 per cent. above the average of 11 years; extremes 20 miles and 8 miles. R. Bowie Walcott.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1885.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| England, London | 62·6 | 20 | 26·5 | 8 | 49·4 | 33·0 | 33·6 | 76 | 78·7 | 28·0 | 1·65 | 7 | 5·8 |
| Malta | 82·2 | 11 | 46·6 | 26 | 65·7 | 52·1 | 49·3 | 77 | 131·3 | 41·1 | 0·17 | 5 | 2·5 |
| Cape of Good Hope | 96·0 | 3 | 47·0 | 9 | 79·6 | 57·5 | ... | ... | ... | ... | 1·15 | 4 | 3·1 |
| *Mauritius* | 85·0 | 8 | 69·8 | 23 | 83·5 | 72·8 | 69·4 | 78 | 142·9 | 61·1 | 5·73 | 15 | 5·8 |
| Calcutta | 98·7 | 29 | 62·4 | 9 | 91·1 | 70·1 | 67·6 | 70 | 154·9 | 50·0 | 1·01 | 2 | 2·5 |
| Bombay | 90·9 | 30 | 65·0 | 3 | 84·4 | 72·2 | 69·2 | 74 | 144·3 | 53·6 | ·00 | 0 | 1·5 |
| Ceylon, Colombo | 91·2 | 30 | 72·6 | 13 | 88·4 | 77·2 | 76·2 | 81 | 147·2 | 59·8 | 5·71 | 9 | 2·6 |
| *Melbourne* | 95·2 | 18 | 42·5 | 21 | 72·7 | 52·3 | 49·4 | 66 | 142·1 | 30·6 | 2·39 | 12 | 5·8 |
| *Adelaide* | 93·6 | 17 | 45·8 | 20 | 75·8 | 56·1 | 47·5 | 51 | 154·2 | 34·4 | 0·33 | 7 | 4·4 |
| *Wellington* | 72·0 | 2,6* | 46·8 | 20 | 66·4 | 54·2 | ... | ... | 145·0 | 39·0 | 3·43 | 13 | ... |
| *Auckland* | 77·5 | 2 | 49·0 | 18 | 70·4 | 56·5 | 52·9 | 68 | 140·0 | 40·0 | 2·36 | 15 | 5·0 |
| Jamaica, Kingston | 92·2 | 24 | 64·3 | 1 | 85·5 | 68·6 | 69·9 | 81 | ... | ... | 0·29 | ... | 2·4 |
| Barbados | 81·0 | 15 | 68·0 | var. | 79·0 | 69·0 | 69·5 | 77 | 141·0 | ... | 2·07 | 12 | 5·0 |
| Toronto | 43·3 | 31 | 30·8 | 9 | 27·1 | 9·2 | 14·5 | 79 | 116·0 | -12·8 | 1·22 | 14 | ... |
| New Brunswick, Fredericton | 48·8 | 28 | -15·3 | 24 | 28·9 | 3·0 | 14·2 | 77 | ... | ... | 3·92 | 16 | 4·7 |
| Manitoba, Winnipeg | 40·6 | 30 | -34·5 | ... | 21·7 | -5·8 | 8·3 | 84 | ... | ... | 1·12 | 7 | 5·5 |
| British Columbia, Victoria | 67·0 | 17 | 32·0 | 3 | 55·2 | 37·1 | ... | ... | ... | ... | 0·32 | 3 | ... |

* And 14.

### REMARKS, MARCH, 1885.

MALTA.—Mean temp. 57°·5; mean hourly velocity of wind 9·7 miles; sea temp. fell from 62° to 61°. J. SCOLES.

CAPE OF GOOD HOPE.—MAX. temp. 1°·1 below average; min. temp. 0°·2 above average. W. ELLERTON FRY.

*Mauritius.*—Rainfall 1·51 in., mean temp. 0°·3, and mean hourly velocity of wind 1·5 mile below their respective averages; prevailing wind E.S.E., extremes of velocity 22·9 miles on 13th and 1·6 mile on 6th. T or L or both on 7 days. C. MELDRUM, F.R.S.

*Colombo.*—TSS on 4 days and L on 2 other days.—F. C. H. CLARKE, Major R.A.

*Melbourne.*—Mean temp. of air 2°·3, and of dew point 2°·9; humidity 2, and pressure ·043 in. below the average; rainfall ·22 in., and amount of cloud ·3 above. Prevailing winds W. and S. strong on 5 days. L on 3 days, T on 1. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Mean pressure, average; mean temp. (66°·0) 4°·8 below the average of 28 years and far the lowest during that period. The chief defect was in the max. readings, the mean being 6°·2 below the average; weather generally fine and pleasant. W. E. COOKE.

*Wellington.*—A wet month, especially in the early part, and frequently stormy. Mean temp. (60°·3) 2°·0 below average; R ·59 in. above average, L on 4 days. R. B. GORE.

*Auckland.*—Showery and variable in the early part of the month; violent hurricane from N.E. on 14th; thence to the close fine. Rainfall and pressure, average; mean temp. somewhat below it. T. F. CHEESEMAN.

JAMAICA.—The rainfall, over the whole island, was only one-third of the average, and the drought was severely felt over the greater part. MAXWELL HALL.

BARBADOS.—Mean temp. 73°·3, about the average. Prevailing wind N.E.; mean hourly velocity, 14·2 miles; extremes, 19·3 miles and 8·2 miles; rainfall, 9 per cent. below the average. R. BOWIE WALCOTT.

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## WATER STORAGE.

*To the Editor of the Meteorological Magazine.*

SIR,—If the advice (page 100) about storing rainfall was taken it would at once make an enormous difference in the possibility of keeping down insect attacks.

To give just one instance, I went down into Buckinghamshire lately to see about Leaf-roller caterpillar attack. There was an enormous old oak, which it was a special object to bring round, and they *had* water supply, so I suggested getting the fire engine, and the tree was drenched and brought round.

If there was water supply we could save thousands and millions of pounds that go through "Turnip Fly," Caterpillars, &c., &c.

Yours very truly,

ELEANOR A. ORMEROD.

*Dunster Lodge, Spring Grove, Isleworth, August 7th, 1885.*

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## ATLANTIC TIDES AS STORM WARNINGS.

*To the Editor of the Meteorological Magazine.*

SIR,—The object of my letter on the above subject was to draw attention to the fact, which is indisputable, that the Atlantic *does* rise on the western shores for a considerable period before the approach of a storm, and to invite the attention of observers, favourably situated, to ascertain the data in connexion therewith.

I am now informed that the period extends to four and even six days under favourable circumstances, and if this can be maintained by observation, little more need be said to establish the importance of the phenomenon. Until then it is perhaps premature to attempt to theorize on the subject.

Yours, &c.,

G. WOULFE BRENAN, C.E.

*Craigvarren, Oban, N.B.*

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## WATERSPOUT OFF SHEERNESS.

*To the Editor of the Meteorological Magazine.*

SIR,—It may be of interest to some of your readers to know that a waterspout was observed just off the Nore Point, Sheerness, between 2 and 3 p.m. on the 20th ult. After the usual *modus operandi* of this phenomenon was complete, the spout was drawn up into the cloud, which took part in its formation. This cloud, thus heavily charged with water, then moved inland in a nearly due southerly direction, apparently to the range of hills which forms the backbone of Kent, discharging its contents as it proceeded. No damage is reported to have been done in its track; indeed, it was rather the reverse, as the pastures, &c., were much refreshed by the rainfall, which was greatly needed. A thunderstorm, with hail, and heavy passing showers, occurred later on in the afternoon.

R. MONTAGUE MERCER.

*Rodmersham House, near Sittingbourne, September, 1885.*

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# SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 5·48 | XI. | Rhayader, Nantgwillt.. | 8·19 |
| ,, | Margate, Birchington... | 3·85 | ,, | Carno, Tybrith ... ..... | 5·68 |
| ,, | Littlehampton ..... | 4·56 | ,, | Corwen, Rhug ..... | 5·22 |
| ,, | Hailsham ..... | 4·89 | ,, | Port Madoc ..... | 7·01 |
| ,, | I. of W., St. Lawrence. | 3·81 | ,, | I. of Man, Douglas ..... | 6·00 |
| ,, | Alton, Ashdell..... | 5·92 | XII. | Stoneykirk, Ardwell Ho. | 4·37 |
| III. | Winslow, Addington ... | 4·51 | ,, | Melrose, Abbey Gate... | 3·71 |
| ,, | Oxford, Magdalen Col... | 4·36 | XIII. | N. Esk Res. [Penicuick] | 5·10 |
| ,, | Northampton ..... | 3·65 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | 2·93 | ,, | Glasgow, Queen's Park. | 5·01 |
| ,, | Wisbech, Bank House.. | 3·65 | XV. | Islay, Gruinart School.. | 7·66 |
| IV. | Southend ..... | ... | XVI. | St. Andrews, Newton Bk | 4·55 |
| ,, | Harlow, Sheering ... .. | 3·71 | ,, | Balquhidder, Stronvar.. | 11·49 |
| ,, | Rendlesham Hall ..... | 5·75 | ,, | Dunkeld, Inver Braan.. | 5·56 |
| ,, | Diss ..... | 5·49 | ,, | Dalnaspidal H.R.S. ... | 9·29 |
| ,, | Swaffham ..... | 4·57 | XVII. | Keith H.R.S. ..... ..... | 3·46 |
| V. | Salisbury, Alderbury... | 4·99 | ,, | Forres H.R.S. ..... ... | 3·07 |
| ,, | Warminster ..... | 5·14 | XVIII. | Strome Ferry H.R.S.... | 9·97 |
| ,, | Calne, Compton Bassett | 4·27 | ,, | Lochbroom ..... | 6·81 |
| ,, | Ashburton, Holne Vic.. | 7·79 | ,, | Tain, Springfield..... | 2·94 |
| ,, | Holsworthy, Clawton... | 6·90 | ,, | Loch Shiel, Glenaladale | 17·96 |
| ,, | Hatherleigh, Winsford. | 8·34 | ,, | Invergarry ..... | 8·68 |
| ,, | Lynmouth, Glenthorne. | 5·81 | XIX. | Lairg H.R.S. ..... | 8·33 |
| ,, | Probus, Lamellyn ..... | 6·46 | ,, | Forsinard H.R.S. ..... | 4·40 |
| ,, | Wincanton, Stowell Rec. | 6·06 | ,, | Watten H.R.S. ..... | 3·97 |
| ,, | Wells, Westbury..... | 4·98 | XX. | Dunmanway, Coolkelure | 10·57 |
| VI. | Bristol, Clifton ..... .. | 4·84 | ,, | Fermoy, Gas Works ... | 4·62 |
| ,, | Ross ..... | 3·13 | ,, | Tralee, Castlemorris ... | 4·22 |
| ,, | Wem, Sansaw Hall..... | 3·06 | ,, | Tipperary, Henry Street | 3·14 |
| ,, | Cheadle, The Heath Ho. | 3·53 | ,, | Newcastle West ..... | 5·25 |
| ,, | Worcester, Diglis Lock | 3·57 | ,, | Miltown Malbay..... | 6·82 |
| ,, | Coventry, Coundon ..... | 2·83 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 2·89 | XXI. | Carlow, Browne's Hill.. | 5·20 |
| ,, | Ketton Hall [Stamford] | 3·01 | ,, | Navan, Balrath ..... | 3·88 |
| ,, | Horncastle, Bucknall ... | 3·66 | ,, | Mullingar, Belvedere ... | 5·45 |
| ,, | Mansfield, St. John's St | 2·98 | ,, | Athlone, Twyford ..... | 7·20 |
| VIII. | Macclesfield, The Park. | 4·31 | XXII. | Galway, Queen's Col.... | 5·51 |
| ,, | Walton-on-the-Hill..... | 4·64 | ,, | Clifden, Kylemore ..... | 11·26 |
| ,, | Lancaster, South Road. | 4·36 | ,, | Crossmolina, Enniscoe.. | 7·27 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 4·70 |
| IX. | Wakefield, Stanley Vic. | 1·94 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·80 | ,, | Rockcorry..... | 5·53 |
| ,, | Scarborough..... | 2·53 | ,, | Warrenpoint ..... | 6·08 |
| ,, | East Layton [Darlington] | ... | ,, | Newtownards ..... | 3·77 |
| ,, | Middleton, Mickleton.. | 2·76 | ,, | Belfast, New Barnsley.. | 5·97 |
| X. | Haltwhistle, Unthank.. | 2·59 | ,, | Cushendun ..... | 4·62 |
| ,, | Shap, Copy Hill ..... | 6·77 | ,, | Bushmills ..... ..... | 5·77 |
| XI. | Llanfrechfa Grange .... | 6·59 | ,, | Stewartstown ..... | 5·70 |
| ,, | Llandovery ..... | 7·28 | ,, | Buncrana ..... | 4·84 |
| ,, | Castle Malgwyn ..... | 6·01 | | | |

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# SEPTEMBER, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 4·30 | + 1·79 | 1·48 | 10 | 19 | 76·5 | 15 | 33·7 | 27 | 0 | 3 |
| II. | | Maidstone (Hunton Court)... | 3·67 | + 1·36 | 1·25 | 16 | 18 | ... | ... | ... | ... | ... | ... |
| " | | Strathfield Turgiss ..... | 4·26 | + 1·96 | 1·64 | 10 | 12 | 74·0 | 15 | 31·4 | 26 | 1 | 3 |
| III. | | Hitchin ..... | 3·86 | + 1·38 | 1·56 | 10 | 22 | 68·0 | 15 | 31·0 | 26 | 2 | ... |
| " | | Banbury ..... | 3·50 | + ·69 | 1·12 | 10 | 21 | 78·0 | 15 | 30·0 | 28 | 2 | ... |
| IV. | | Bury St. Edmunds (Culford) | 4·27 | + 1·49 | ·91 | 10 | 21 | 75·0 | 15 | 28·0 | 26 | 2 | ... |
| " | | Norwich (Cossey) ..... | 4·65 | + 1·57 | ·80 | 10 | 23 | 74·5 | 15 | 32·5 | 27 | 0 | 4 |
| V. | | Weymouth(LangtonHerring) | 3·18 | ... | 1·15 | 10 | 17 | ... | ... | ... | ... | ... | ... |
| " | | Barnstaple..... | 6·88 | + 2·60 | 2·15 | 10 | 20 | 73·0 | 7 | 38·0 | 26 | 0 | ... |
| " | | Bodmin ..... | 8·74 | + 3·50 | 3·02 | 10 | 23 | 65·0 | 4, 14 | 36·0 | 27 | 0 | 2 |
| VI. | | Stroud (Upfield) ..... | 3·89 | + ·64 | 1·28 | 10 | 18 | 72·0 | 17 | 30·0 | 27 | 1 | ... |
| " | | ChurchStretton(Woolstaston) | 4·08 | + ·61 | ·60 | 10 | 25 | 68·0 | 15 | 35·0 | 26 | 0 | ... |
| " | | Tenbury (Orleton) ..... | 3·78 | + ·43 | ·98 | 10 | 23 | 71·8 | 15 | 27·0 | 28 | 3 | 3 |
| VII. | | Leicester ..... | 3·16 | ... | ·88 | 10 | 18 | 76·0 | 15 | 31·6 | 28 | 1 | 7 |
| " | | Boston ..... | 3·11 | + ·50 | ·69 | 10 | 19 | 75·0 | 15 | 34·0 | 26 | 0 | ... |
| " | | Grimsby (Killingholme)..... | 2·72 | — ·35 | ·41 | 4 | 21 | 70·5 | 15 | 35·0 | 26 | 0 | ... |
| " | | Hesley Hall [Tickhill]..... | 1·66 | ... | ·28 | 8 | 18 | 77·0 | 15 | 31·0 | 26 | 1 | ... |
| VIII. | | Manchester (Ardwick)..... | 4·46 | + ·69 | 1·03 | 2 | 24 | 69·0 | 15 | 36·0 | 28 | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·89 | — ·19 | ·72 | 3 | 16 | ... | ... | ... | ... | ... | ... |
| " | | Skipton (Arncliffe) ..... | 7·45 | + 1·87 | 1·04 | 2 | 26 | 68·0 | 1 | 31·0 | 27 | 2 | ... |
| X. | | North Shields ..... | 2·46 | + ·14 | ·39 | 28 | 18 | 71·5 | 15 | 32·5 | 26 | 0 | 1 |
| " | | Borrowdale (Seathwaite)..... | 18·90 | + 5·68 | 2·45 | 12 | 26 | 63·9 | 6 | 32·0 | 27 | 1 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 6·25 | + 1·45 | 1·62 | 10 | 22 | ... | ... | ... | ... | ... | ... |
| " | | Haverfordwest ..... | 8·84 | + 3·79 | 1·37 | 6 | 20 | 67·0 | 6 | 30·0 | 26 | 1 | 4 |
| " | | Plinlimmon (Cwmsymlog) ... | 8·39 | ... | ·85 | 28 | 24 | ... | ... | ... | ... | ... | ... |
| " | | Llandudno..... | 2·96 | — ·79 | ·75 | 30 | 19 | 66·8 | 4 | 40·2 | 26 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 7·30 | + 2·89 | ·98 | 28 | 18 | 65·0 | 3, 7 | 30·2 | 27 | 1 | ... |
| " | | Jedburgh (Sunnyside)..... | 2·13 | — ·46 | ·34 | 26 | 17 | 65·0 | 6 | 30·0 | 1, 27 | 2 | ... |
| XIV. | | Douglas Castle (Newmains) | 5·98 | + 1·58 | 1·06 | 11 | 20 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 10·97 | + 5·21 | 1·46 | 11 | 26 | ... | ... | ... | ... | ... | ... |
| " | | Oban (Craigvarren) ..... | 10·19 | ... | 1·31 | 20 | 26 | 64·3 | 7 | 34·0 | 27 | 0 | ... |
| " | | Mull (Quinish)..... | 10·75 | ... | 1·27 | 12 | 27 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 4·90 | + 1·67 | 1·20 | 13 | 15 | ... | ... | ... | ... | ... | ... |
| " | | Arbroath ..... | 3·52 | + ·45 | ·73 | 8 | 15 | 64·0 | 6 | 35·0 | 27 | 0 | ... |
| XVII. | | Braemar ..... | 4·93 | + ·99 | ·80 | 4 | 21 | 64·0 | 1 | 26·0 | 27 | 2 | 7 |
| " | | Aberdeen ..... | 3·90 | ... | ·83 | 20 | 22 | 65·0 | 19 | 32·0 | 26 | 1 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| " | | Culloden ..... | 3·17 | + ·27 | ... | ... | ... | 65·4 | 4 | 32·0 | 1, 27 | 2 | 4 |
| XIX. | | Dunrobin ..... | 4·51 | ... | ·55 | 2 | 19 | 63·0 | 14 | 34·0 | 27 | 0 | ... |
| " | | Orkney (Sandwick)..... | 3·78 | + ·29 | ·64 | 2 | 21 | 60·5 | 7 | 36·7 | 1 | 0 | 1 |
| XX. | IRELAND. | Cork (Blackrock)..... | 6·30 | + 2·15 | 1·78 | 1 | 25 | 72·0 | 2 | 34·0 | 26 | 0 | ... |
| " | | Dromore Castle ..... | 7·61 | ... | 1·45 | 18 | 23 | 66·0 | 10 | 35·0 | 26 | 0 | ... |
| " | | Waterford (Brook Lodge) ... | 5·13 | ... | 1·35 | 1 | 22 | 67·0 | 5 | 33·0 | 27 | 0 | 7 |
| " | | Killaloe ..... | 5·46 | ... | ·96 | 18 | 24 | 66·0 | 1 | 31·0 | 27 | 1 | ... |
| XXI. | | Portarlington ..... | 3·52 | + ·34 | ·48 | 1 | 23 | 67·0 | 14 | 35·0 | 26 | 0 | ... |
| " | | Dublin (FitzWilliam Square) | 2·86 | + ·45 | ·36 | 2 | 23 | 68·9 | 12 | 34·4 | 27 | 0 | 3 |
| XXII. | | Ballinasloe ..... | 5·30 | + 1·34 | ·92 | 18 | 23 | 65·0 | 2, 4 | 30·0 | 27*a* | 3 | ... |
| XXIII | | Waringstown ..... | 4·78 | + 1·38 | ·77 | 14 | 25 | 70·0 | 3 | 30·0 | 27 | 1 | 2 |
| " | | Londonderry (Creggan Res.). | 4·43 | ... | ·68 | 28 | 26 | ... | ... | ... | ... | ... | ... |
| " | | Omagh (Edenfel) ..... | 5·43 | + 1·39 | ·83 | 4 | 27 | 62·0 | 12 | 30·0 | 26 | ... | .. |

*a* And 28.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The weather, after the first week, was broken and unsettled, rendering the in-gathering of the harvest a slow and tedious business. The rainfall of the 11th was the heaviest in 24 hours ever recorded here in September. T on 25th. Ivy in bloom on 11th.

HITCHEN.—The coldest September for thirty years, and one of the wettest.

BANBURY.—Mean temp. (52°·5), 4° below the average. Harvest in the neighbourhood almost all secured in fair condition by the close of the month. Kidney beans and dahlias much injured by frost on the 28th. T and L on 7th; high wind on 10th and 15th.

CULFORD.—A very unsettled month, with T and L, and frequent heavy rains, and cold nights; on the 26th the frost cut down most of the bedding and other tender plants.

LANGTON HERRING.—Mean temp. nearly two degrees below the average of 13 years; the great cold from 25th to 28th inclusive was very remarkable, and S sleet and H fell at many places. Very stormy on 10th and 11th; heavy dew on 20th and 24th.

BODMIN.—A very cold September, with excessive rainfall, the fall on 10th far exceeded any other day's record during the 36 years that observations have been made. Mean temp. 56°·5.

WOOLSTASTON.—A month of constant R, most disastrous for the later harvest.

ORLETON.—A very stormy changeable month, with rainfall much above the average. The nights were generally cold, and the days cloudy, and frosts occurred on 26th, 27th and 28th; the wind was frequently very rough, and the showery weather delayed the in-gathering of the corn crops. Mean temp. about two degrees below the average of 24 years; pressure unsteady, but the fluctuations not great; distant T on 4th.

KILLINGHOLME.—R fell frequently, but not continuously, retarding harvest, but the air being cool, the corn did not suffer as might have been expected. T and L on 3rd, 4th and 5th.

MANCHESTER.—The month was very unsettled, and there were few fine days; the rainfall was considerable in quantity, but more marked by its continuance; the weather was cold on several days, with two or three degrees of frost a short distance from the City; a little T, but of small consequence.

SEATHWAITE.—In seven hours on the 11th and 12th, 4·27 in. of R fell, causing a flood that did much damage; and on 10 days, one inch or upwards fell. First S on hills on 23rd. H, T, L, and heavy R on 30th; T on 5th.

## WALES.

HAVERFORDWEST.—The wettest September since 1866, when the rainfall was 9·51 in. on 23 days. Fortunately it was never stormy, although fresh high wind prevailed in the dry intervals, neither was the air warm and close, or the consequences would have been most disastrous. Fully one half of the harvest was still in the fields at the close—a melancholy dashing of high hopes, no season of late years equalled it in quality of straw and grain. It was as wet, though not as stormy, as the disastrous September of 1871.

LLANDUDNO.—Mean temp. 2°·0 below the average; monthly and diurnal range slightly less than the average. The first fourteen days were, although showery, fairly fine, the next 8 days were dry, bright, and very fine, and the remainder of the month was cold and showery; gale from S.W. on 11th, and very stormy on 24th and 25th, T and L on 24th; 127 hours of bright sunshine were recorded.

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## SCOTLAND.

CARGEN.—A very wet and stormy month; mean temp. 3°·2 below the average, the coldest September since 1860, when the mean temp. was 51°·6. The corn crops suffered very much from the excessive rainfall and gales of wind; T on 2nd, L on 13th.

JEDBURGH.—The month was marked by very low temp., a frost occurring on the 1st, which stopped the further growth of potatoes. Though there was a good deal of R, it was much needed for the root crops, and as the cold winds rapidly dried the corn in the fields, harvesting went on almost without intermission. In the higher districts much was still out at the close, but in good condition.

OBAN.—The rainfall was the most continuous in any month for some years, and the temperature was very low; the result being disastrous for the white crops which were far behind in quantity and quality. The rainfall on the 20th was constant and exceptionally heavy for seven hours; gales on 9 days, H on 24th.

QUINISH.—A very wet, cold, stormy month from first to last; very little corn secured in this district.

BRAEMAR.—A month of unsettled weather with occasional showers of S; very unfavourable for harvest work; crops short and much below the average.

ABERDEEN.—The weather was unsettled throughout the month, and the rainfall above the average. Auroræ seen on 12th and 15th; a beautiful lunar rainbow at 8 p.m. on 24th; vivid L on 3rd, H on 26th.

CULLODEN.—Harvest was retarded by the adverse weather, R falling in small quantities all through the month, with low temp. A very severe frost occurred on the morning of the 1st, injuring the potato crop.

DUNROBIN.—A wet month; bad harvest weather.

## IRELAND.

DROMORE.—A wet and very cold month with some H showers; prevailing winds N.E. and N.W.; gales from S.W. towards the close.

WATERFORD.—A very wet and windy month; rainfall greatly above the average.

KILLALOE.—A very bad harvest month, with wind and R in excess; mean temp. 53°·3; sharp frost on 27th.

DUBLIN.—The weather was very unsettled, rainy, and cool during the greater part of the month. H on 10th, 25th, and 30th, aurora on 4th, solar halos on 11th and 22nd, fog on 14th and 17th, L on 5 days; mean temp. (53°·2) 1°·9 below the average; the month was decidedly cold, but not so cold as September 1866 (mean temp. 51°·9), 1873 (53°·0), 1877 (52° 4), 1882 (52°·0). Mean humidity, 83; mean amount of cloud, 4·9; prevailing winds W., S.W., and N.W.

BALLINASLOE.—A very wet and stormy month, doing great injury to the harvest; L and T on 2nd.

EDENFEL.—A more complete or unwelcome reversal of all the characteristics of the preceding summer months could not have taken place; not one "harvest day" broke the monotony of the cold, tempestuous, and thoroughly inclement weather which prevailed throughout the month; nearly half the grain was still in the fields at the close, and much of it uncut. Several swallows, driven back apparently by stress of weather, were to be seen at the close, and some in their summer nests dead.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXVIII.] NOVEMBER, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

## THE RAINBAND VINDICATED.

BY J. RAND CAPRON, ESQ., F.R.A.S.

(*Continued from p.* 132.)

One important requirement not yet fulfilled is a gauge or micrometer to estimate the tint and width of the rainband or bands. The width may be measured (though with difficulty in small instruments) by some form of moving web or point, but a comparison spectrum for tint is far more difficult to obtain. Mr. Mill made to me a very ingenious suggestion of the use of didymium for this purpose. This gives as a salt in solution, or as a component of glass, an absorption band, varying in tint with the thickness of the quantity of the solution or of the glass, and he proposed to use a sliding wedge-shaped cell or plate, and to adjust this till it accorded with the rainband.

Unfortunately the didymium band falls exactly in the place of a rather strong low sun band, on the more refrangible side of D, and is complicated by it. I propose to avoid this inconvenience by means of a reflecting prism so arranged that the light to pass through the didymium solution or glass shall come from the zenith. For micrometric measurement of the band width, and for comparing the didymium or any other selected band with the rainband, I know of no better arrangement than one illustrated below (fig. 4). In this case the slit plate is divided horizontally in two, and the upper half with its spectrum is made by means of a micrometer screw to traverse the lower half as shown in the diagram (fig. 5).

By this means measurements and comparisons may be easily made, *e.g.*, the D lines in the upper spectrum may be used to measure the width of the rainband in the lower, or the didymium band in the upper may be brought into direct comparison with the rainband. The D line or any other may also be brought over and compared with F or other of the solar lines. All these comparisons are thus rendered less difficult than when the bands and lines are a distance apart.

It has been proposed to place a "condensing lens" in front of the slit, but I do not for ordinary use see any advantage in it. The sky light cannot be condensed, and I doubt whether in any picture



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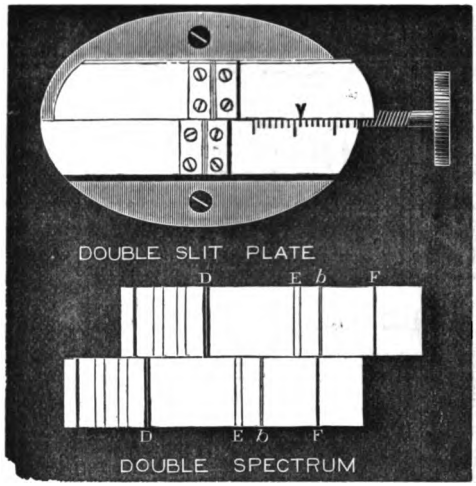


*Fig. 4*

*Fig. 5*

formed on the slit of a small spectroscope it would be possible to distinguish a cloud spectrum from that of the sky.

In the case of larger spectroscopes, with considerable slit length, the device might perhaps be more useful.

## OBSERVATIONS AND THEIR RESULTS.

As the number of observers, evidenced by the sale of instruments, has increased, so also have the methods, quantity, and quality of the observations.

With regard to the methods, the more simple form of observation recommended by me in the "Plea" has been by some extended, and the lesser rainbands, the dry air bands, and the atmospheric lines other than D have all been enlisted into service. By the varying thickness and appearance of these, the judgment obtained from the larger rainband near D has been reinformed and strengthened.

Much information on this head will be found in Mr. Cory's "How to foretell."

That observer, too, has extended his scale from Prof. Piazzi Smyth's 10 to 20. After much experience, I still think the scale given in the "Plea," 0 to 5, is the more useful for general observers, except that I have introduced 0–1 as indicating a very faint band. Mr. Cory says "the rainband is never absent." This may be strictly true, but it is more convenient in practice to begin with 0 as indicating all that is seen in dry fine weather.

Mr. J. A. Bramley Moore in a letter to *Knowledge*, No. 60, p. 485, remarks :—"(2) If the sun lines in the green instead of appearing clear and distinct are thick and muddy, heavy rain (like thunder rain) will follow, and this whether there is any "rainband" in the red or not.

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"(3). If on moving the spectroscope slightly to the left the "blue" appears very light, and the dark line down is clearly seen, then wind may be expected." He adds that this "never fails."

"(4) On one occasion on moving the spectroscope as above, the green instead of giving way to the blue, seemed to fight with it, and *pass over it.* A thunderstorm followed."

Twice since he found the same thing to occur. Mr. Cory, p. 30, corroborates this form of thunderstorm prediction.

Mr. Cory also notices that the rainband decreases before snow, and his diagram on Plate III. illustrates this.

He also recommends pointing the spectroscope to the direction from which the wind comes; a useful suggestion.

Coming now to the question of how far the spectroscope makes good its predictions, we have:—

(1) General evidence as afforded by the statements of Prof. Piazzi Smyth, Mr. Cory, Mr. Mill, Mr. Clapham, and others, who have borne testimony in favour of its value for forecasting.

(2). Recorded sets of observations, either daily or as averages for longer periods; and either in figures, or as lines and curves, expressing the result in a graphical form.

In a letter to the *Times* of September, 23, 1882, Prof. Piazzi Smyth gives a fortnight's notes, September 1st to 15th, 1882, in three columns—(1) Temperature, (2) Rainband intensity, (3) Rainfall at the Royal Observatory, Edinburgh. A glance at these will show how rain fell as the rainband increased, and how some small successive rainbands led up to a fall of rain.

Mr. Cory has not given statistics in his book, but in a letter to the *Times*, February 1st, 1881, he gives a list of observations taken at 9.15 a.m. daily for the month of January of that year. The results are as follows:—

| | | |
|---|---|---|
| 1 case of | 70% rainband | was followed by heavy rain. |
| 2 cases of | 60% " | " " " rain in both. |
| 8 " | 50% " | " " " rain every time. |
| 7 " | 40% " | " " " rain in 5, overcast in 2 cases. |
| 9 " | 30% " | " " " 6 of rain. |
| 1 case of | 40% decreasing to 30% | was followed by nimbus. |
| 1 " | 30% increasing to 40% | " " " rain. |
| 1 " | 20% " " 30% | " " " slight rain and heavy snowfall. |
| 1 " | 20% | was followed by very fine weather. |

31 days.

These figures seem to be conclusive as to the rainband's predictive value.

To Mr. Cory I am also indebted for the graphical chart, a copy of which I give on Plate I., showing the mean per-centage of rainband

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in dotted curves, and the amount of rainfall in vertical lines for each month during the year 1882 and a part of 1883, at Buckhurst Hill, Essex. The observations were taken in the N. direction, three times a day, and at an angle of from 10 to 20 degrees above the horizon. As Mr. Cory remarks in his accompanying letter to me, "there is a decided connection between the two." The high per-centage of rainband in June and July, with a not excessive fall, is due to the rainband being stronger in summer. The heavy fall in the later half of October was preceded by a very high mean rainband during the first half of the month. Of the fall in March, with a low rainband, half was snow, and the actual amount of rain was very small.

These apparent discrepancies are consistent with the rainband laws.

Mr. Mill, in his "The Rainband," gives a graphical chart and some tabular statements showing how his rainband predictions were fulfilled.

Tables II., III. and IV. in that work give the results when the rainband was compared in intensity with the Fraunhofer lines, *b* and *F*, during seven months of 1882.

These tables show there was 8 per cent. of cases when the rain *did not*, and 92 per cent. of cases when the rain *did*, follow maximum rainband; and 21 per cent. of cases when the rain *did*, and 79 per cent. of cases when the rain *did not* follow a minimum rainband.

Table V. gives the result of observations made in Callander for the months June to December, 1882:—

| | |
|---|---|
| Rain predicted ... ... ... ... ... | 125 |
| Rain followed ... ... ... ... ... | 97 |
| Per-centage of fulfilled predictions ... | 78 |
| No rain predicted... ... ... ... ... | 80 |
| No rain followed ... ... ... ... ... | 51 |
| Per-centage of fulfilled prediction ... | 64 |
| Total predictions ... ... ... ... ... | 205 |
| Total fulfilments ... ... ... ... ... | 148 |
| Per-centage of total fulfilled predictions... | =72 |

Table VI., for January to September, 1883, gives the total of fulfilled predictions at 209, and of unfulfilled 64. Per-centage of fulfilled predictions = 76·5.

With respect to the Guildown observations, these have been taken since the 1st of July, 1880, at 9 a.m. daily, with the spectroscope, and in the manner mentioned in the "Plea." All the barometric and other meteorological observations for a half year are from time to time reduced to curves upon a chart, in which, in tenths of inches, the days of the year form the abcissæ, while the readings of each instrument form the ordinates. In these the rain is shown in tenths of inches of fall, and the rainband in degrees of strength 0—1 to 5.

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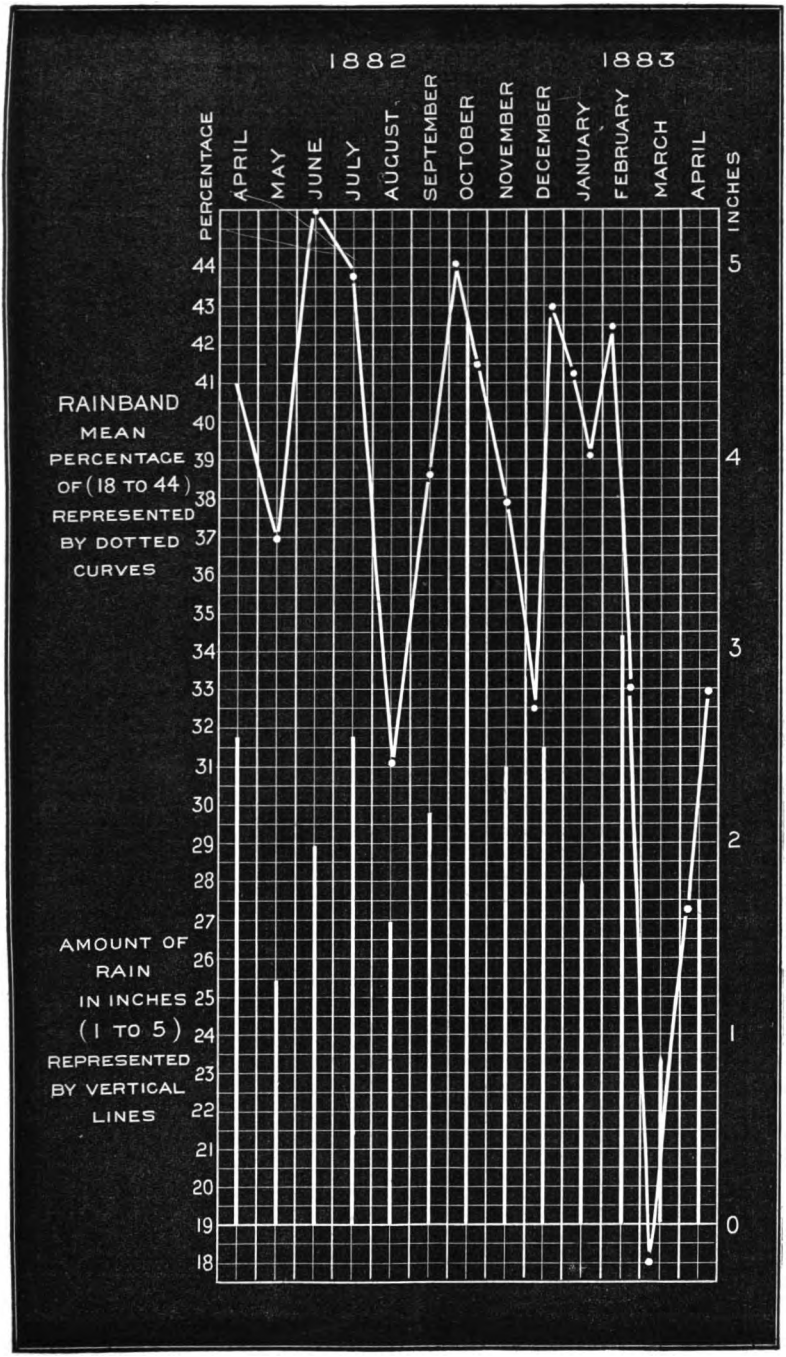
PLATE I.




MONTHLY RAINFALL AND RAINBAND, 1882-3.

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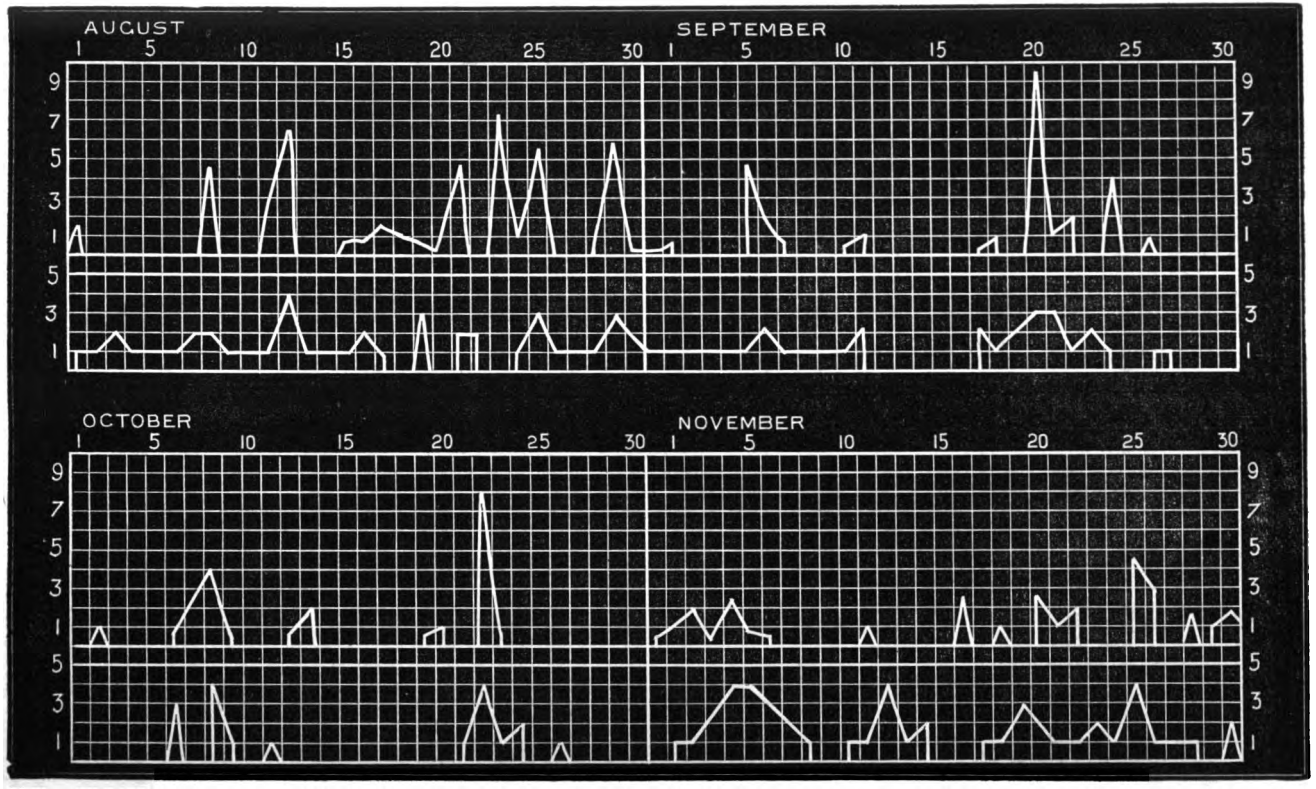
# Plate II.




RAINFALL AND RAINBAND AT GUILDOWN FOR FOUR CONSECUTIVE MONTHS OF 1881.

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The rainfall and rainband portion of the chart for four consecutive months of 1881 is shown in Plate II.

These charts if put together would extend to a length of 12 feet 2 inches, and comprise over 1,800 observations. I have not tabulated the results except for yearly values, but a glance at the curves ought to convince the most sceptical that the connection between the rainband and rainfall is, as a general rule, well established.

The yearly values run out thus :—

*Table of Yearly Values of Rain and Rainband.*

| Year. | Rainfall in inches. | Rainband in numbers. | |
|---|---|---|---|
| 1881..... | 25·68 | 353·5 | |
| 1882..... | 28·10 | 392·5 | 1·0 of Rainband |
| 1883..... | 24·35 | 404·5 | = ·60 of Rain. |
| 1884..... | 18·70 | 314·0 | |

It is obvious that if such a method of long-period comparison as this shows an approximate reciprocal rise and fall in the total values of rain and rainband it is as much as can be expected from it. If special circumstances prevail, such as fogs and mists, which give a low rainband without rain, we may expect to find (as in 1883 and 1884) an advance of total rainband over rain for that year.

Other observers doubtless have preserved records which have not come under my notice ; but taking Mr. Cory's, Mr. Mill's, and the Guildown ones alone, I think the fact is established that the little dark "bar" in the yellow of the spectrum can well hold its own in forecast with any other "bars," and that its character has been amply vindicated.

It now only remains to refer to one or two meteorological subjects allied to the rainband, but not generally finding a place with the observations of pressure, temperature, wind, &c. These are ozone, atmospheric electricity, and the weather compass for forecasting invented by the late Prof. Klinkerfues.

## THE RAINBAND AND OZONE.

Mr. Cory, in his "How to Foretell," (p. 32) remarks that the blue and yellow colours in the spectrum are useful guides to the presence or absence of ozone. If the air is very pure, the blue will be clear, and F will stand out distinctly, while the yellow will show itself as a true colour or have an orange tint. If the reverse, the yellow will have a greenish hue, and the blue will be deep and dark, with an indistinct F.

I have not particularly observed these colour changes, but the meteorological charts above mentioned contain ozone curves on the same principle as those of the rainband, and for similar periods. The

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scale for rainband is, as before, 0–1 to 5; that for ozone 1 to 10 of Negretti and Zambra's scale for their iodide of starch papers. A portion of one of the charts comprising four months (the first of each quarter of 1882) is given in Plate III. An examination of this will show that generally the curves of rainband and ozone agree in rising and falling together. It does not often occur that ozone is nil; but when it is, rainband also is found absent. This is indeed what might have been expected, for with warm winds, W. and S., the rainband is reinforced; with cold winds, N. and E., it is depressed. A similar effect, but even more regular in its action, is found with the ozone tests. Thus a S.W. wind gives the strongest tinted papers; a N.E. wind the lightest. We know so very little of ozone and its properties that it would not be safe to connect its quantity in the air with conditions of moisture, though such a connection may be fairly suspected.

Guildown is remarkable for exceeding in average quantity of ozone places situate much nearer the sea. This is probably due to its altitude of 225 feet, and to an open valley to the W. from which there is a prevalent air current.

## ATMOSPHERIC ELECTRICITY.

In the "Plea" I suggested that observations of atmospheric electricity might usefully accompany those of rainband. The relation of these to each other becomes more apparent when the influence of electricity upon aqueous particles is considered, and how the size of these latter determine the strength of the rainband.

When these are minute in the form of transparent water vapour, evidenced only by the hygrometer, the rainband is strong. When the particles are larger in the shape of visible fog or mist, the rainband considerably weakens. Lastly, when the gross particles fall as heavy rain-drops or snow-flakes, there is frequently no rainband, or hardly any. Now, the property of atmospheric electricity (as shewn in the familiar experiment of a sponge suspended from the prime conductor of an electrical machine) is, when developed, to cause the finer cloud particles, by mutual repulsion in the first instance, to coalesce and descend as rain. Electric action is always strongly marked when rain suddenly falls, even to the extent of yielding sparks from a properly insulated conducting wire, and it has evidently much to do with the breaking up of clouds. I have not traced, as Mr. Moore and Mr. Cory have, a forecast of storms by the aspect of the rainband, or the colours of the spectrum, but I have noticed a sudden increase of atmospheric electricity, and a weakening of the rainband frequently to accompany a clearing shower.

Those who desire to combine observations of atmospheric electricity with those of the rainband, will find the mode and the apparatus used fully described and illustrated in the *Meteorological Magazine* for August and October 1885.

The collecting is effected by means of elevated points, or a water stream, and the examination by a Bohnenberger suspended gold leaf

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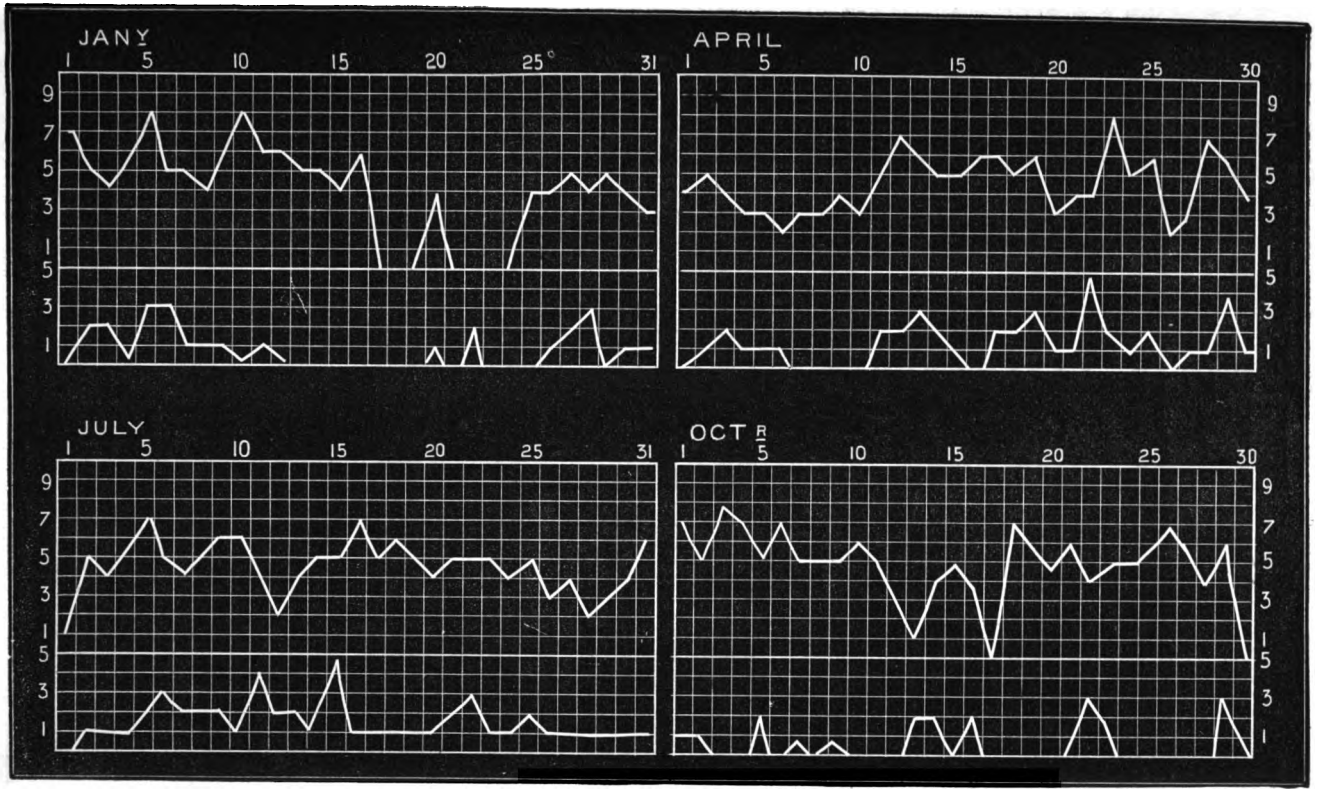
## Plate III.




OZONE AND RAINBAND AT GUILDOWN FOR FOUR MONTHS OF 1882.

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electrometer; or by a Thomson's quadrant electrometer, excited by a chloride of silver battery.

## KLINKERFUES' WEATHER COMPASS.

Lastly, I have to notice an instrument invented by the late Prof. Klinkerfues, of Göttingen, for the purpose of weather forecast. It is an ingenious combination of an aneroid barometer, a string hygrometer, and a wind scale, jointly affording indications of the effects of pressure, moisture and wind. A general idea of its construction will be obtained from the annexed wood-cut.

In this drawing—*a* is the aneroid vacuum box; *b*, moveable weather scale; *s*, moveable wind scale; *c*, hygrometric hair string; *d*, segment actuating index; *e*, lever connecting barometric with hygrometric effects; *f* and *g*, arms to which the hair string is attached; *h*, lower end of index, the upper end of which projects on to the weather scale.

The working arrangement is such that in dry air conditions the hygrometer string acts *with* the barometer for a rise; and in moist weather *against* it; and the two instruments thus combine in a joint reading, depending on the variation of each. When fine weather is approaching, the hygrometer will give the barometer an extra "pull up," and in moist assist it in "a fall," while at times the two may balance one another.

In this way more variation is obtained than with the ordinary barometer, and the concurrent effects of pressure and moisture are read off.

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To forecast, the method is this—

At any definite time, say 9 a.m., set the outer dial with the words describing the weather, "Rain," &c., with the inner wind dial, so that the word denoting the prevailing weather will stand against the wind direction at the time, *e.g.*, set the centre of the larger dial "Change" against the centre of the wind dial "North;" then turn *both* dials *together*, until the index covers the words "Change" and "North." Twelve hours after, we will suppose the index to have risen to "Fair," and the wind to have changed to the "West." We must now move the outer dial *only* in the wind direction, so as to correspond with the pointer "West."

This will bring "Change" again under the index, and indicate that the prospect of fair weather shown by the index rise has been neutralized by the wind change, and changeable weather may consequently be predicted. Had the wind gone Eastward with the index rise, the words "Set Fair" would have taken the place of "Fair," and continuous fine weather would have been foretold. Of course no meteorological instrument is infallible; but I may fairly say that with proper care in setting, much may be made of the "Klinkerfues" for weather forecasting. A friend of mine, a large farmer, has used one for years; and to quote his own words, "I always set my farm work by it."

To prevent disappointment in its use, it is necessary to remember:—

1. That its movements are relative, and are not intended to compare with those of the barometer, being on nearly twice the scale, and acted upon hygrometrically.

2. It must be set each time as before described for a forecast. If left alone with "Change" at top, the index will sometimes run right off the marked part of the dial, in consequence of the greater range.

When sent from abroad by the patentees (Messrs. Biernatzki & Co., of Hamburg), the index is secured to ensure safe travelling. This has to be released, and then set by a screw at the back of the case, either by a barometer, or to the prevailing weather sign. This setting should not afterwards be altered, the dials being in future adjusted to the index, and not it to them.

How sensitive the hygrometric action is, may be seen by breathing on the back of the case, when the index will at once be in movement.

The instrument, although now introduced some years, has not been so well received as it deserves, owing, as correspondents have told me, to the setting arrangement not being properly understood. It is, however, after a little practice, very simple. Though not in strictness an instrument fully adapted to scientific research (a divided scale would add to its value), it certainly merits attention, if it will only succeed in saving a hay crop, or telling the farmer how long his stacks may remain out, matters as to which his mercurial barometer sometimes misleads him. Probably a better acquaintance with it by meteorologists would more fully develope its qualities as an adjunct to the rainband spectroscope, for which it seems well adapted.

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## REVIEWS.

*Stanford's Parliamentary County Atlas and Handbook of England and Wales.* 8vo, 330 pages, 89 maps. London, Stanford.

TRULY we live in times of change; even our geography has constantly to be re-learned, for Mr. Stanford tells us that—

"The new Electoral Divisions, set up by the Redistribution of Seats Act, 1885, have for all Parliamentary purposes superseded the ancient and well-known County; it is therefore important that the area and contents of these new divisions should become generally known, and for this purpose the Atlas and Handbook will be found of great practical value.

"These new Electoral Divisions are based as far as possible upon the hitherto little known Petty Sessional Divisions, which have consequently been brought into considerable prominence. In this Atlas the boundaries and names of the new divisions are marked and written in red, and are further distinguished by various tints of colour."

If this handsome volume had given merely details of population, &c., no matter how good the maps might have been, it would have had little claim on our attention; it would have been indispensable, or nearly so, to aspirants for Parliamentary honours, but meteorologists might have passed it by.

The title is, however, deceptive, not in a bad sense, but in a good one, for the book contains much more than anyone would expect: it contains, besides about 60 county and town maps, the following physical and statistical maps:—Geological Map of Great Britain, Orographical Map of Great Britain; and for England and Wales—River Basins, 24 Maps of Monthly Rainfall, Air, and Sea Temperature and Barometric Pressure, and one each giving the following particulars:— Population, Occupation, Agriculture, Coalfields, Death Rate, Registration Counties, Parliamentary Representation, Dioceses of the Established Church; also maps of the Isle of Man, Jersey, Guernsey, and the smaller Channel Islands.

The non-political portion of the volume is crammed with information, and, carefully studied, would teach most persons much of what they know too little about—their own country.

The first two maps are very suggestive; they are on exactly the same scale, one, the geological, is tinted in accordance with the nature of the soil, the other, the orographical, in accordance with its elevation; and thus the intimate relation between the hardness of the rocks and the altitude of the hills and mountains is at once apparent.

The next map is, for a moment, rather puzzling. It is a geographical map, with the county names, &c., in large type, but it is coloured according to the river basins. Usually in a watershed map the names of the rivers are printed so large, and those of the towns so small, that it is not easy to realise the geographical position of the boundaries. In this map the only special indication of the rivers is well-arranged colouring, and hence one learns a lesson which it is quite possible that even the publisher did not intend to teach. In some cases the lettering is almost amusingly in harmony with the

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colour, *e.g.*, Durham, the normal shape of which is very approximately represented by the basin of the river Wear.

We now come to that which really constitutes a very valuable contribution to meteorology, viz., a set of 24 maps—two for each month. They are arranged in pairs, the two for each month lying open at once. They are all on one scale, and represent England and Wales on the scale of about 100 miles to an inch; as, however, they are beautifully engraved, the smallness of the scale is rather an advantage than otherwise.

The information given is—

(1.) On the first map. Monthly isothermals of air temperature, by Alexander Buchan, Esq., F.R.S.E. (who also contributes two pages of remarks upon the maps).

(2). Coloured shading round the coast, showing the monthly mean temperature of the sea, taken, we believe, from the "Meteorological atlas" published by the Meteorological Office.

(3). On the second map. Coloured rainfall maps, prepared from the tables compiled by G. J. Symons, Esq., F.R.S., from the records of 366 stations during the fifteen consecutive years, 1866–80. The accuracy of these maps is only equalled by the clearness of the printing. We wish that every rainfall observer could have a copy, for they are not merely good, but the only maps of the kind in existence.

(4). Isobars for each ·02 inch of atmospheric pressure. These are, we think, based on the same data as (2).

After this series, follows a map, representing the density of population (showing, by-the-bye, one fact of which we were not aware, viz., that the northern part of the county of Nottingham is more populous than much of Lancashire). The next map, by a mode of colouring new to us, gives a mass of information as to the occupations of the people, even specifying the class of fish caught on the various coasts. We must, however, refrain from describing the rest of the maps, and conclude by congratulating the publisher on the success of his work (many portions of which ought to have been compiled by Government), a work which, whether it pays or not, will always redound to his credit.

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*Crowborough. — Observations upon the Topography and Climate of Crowborough Hill, Sussex, together with other subjects of collateral interest.* By C. LEESON PRINCE, M.R.C.S., F.R.A.S., F.R.Met.Soc., &c. Privately printed. 8vo, 1885.

HAVING been carefully through this book, we begin our remarks by expressing regret that a useful and interesting monograph should not be rendered generally accessible by copies being placed for sale in the hands of a publisher.

Mr. Prince has probably done more for Sussex meteorology than any one living or dead. The present book is in some respects a sup-

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plement to his larger work on *The Climate of Uckfield*, and we hope that, like it, a new edition of Crowborough will soon be accessible to the general public.

Crowborough is a new, and we think desirable, inland health resort, nearly 800 feet above sea level, and about seven miles south-west of Tunbridge Wells. It is formed of the Hastings Beds (or Hastings Sands, as they used to be called), which rest upon the Great Wealden formation of the south-east of England. The view from many parts of Crowborough, but especially from Mr. Prince's Observatory, is exceptionally fine, and Mr. Prince gives a list of (107) churches and (41) important objects which he has been able to identify. He does not give their distances from Crowborough, but among them we notice :—

| | | | |
|---|---|---|---|
| Lydd Church, Kent (near Dungeness), | which is | 34 miles | E.S.E. |
| Fairlight Church, Sussex (near Hastings), | ,, | 25 ,, | S.E. |
| Dyke House, Brighton, Sussex, | ,, | 20 ,, | S.W. |
| Leith Hill, Surrey, | ,, | 24 ,, | W.N.W. |

Altogether we calculate that the landscape must include quite 800 square miles, or about half a million acres.

As regards the climate, Mr. Prince's remarks carry the weight of nearly half a century's experience in continual registration, and of the use of none but the best instruments. Although not himself an admirer of Stevenson's stand, he has kept duplicate records of thermometers exposed according to his own system, and of others in a Stevenson screen. We cannot, in the space here available discuss fully the *pros* and *cons* respecting the exposed thermometers. Mr. Prince has devoted many pages to printing full abstracts of the results, and has thus enabled observers to compare them for themselves. One fact will probably be a surprise to many, viz., that the average daily maximum by a bright bulb mercurial thermometer exposed to the sun 4 ft. above the ground is, even in July, only 5°·7 higher than that in a Stevenson screen, and, on the average of many years, is only 3°·8 higher. The explanation lines in several factors : (1) a bright bulb full of mercury is virtually a spherical mirror, and reflects a very large proportion of the heat it receives ; (2) the bulb is free to radiate its heat to the sky ; (3) the bulb is at times wetted by rain, and then it gives the temperature of the wet bulb instead of that of the dry bulb.

The winter temperature of Crowborough, though low, is very equable, more so even than that of Torquay, Llandudno, or Barnstaple.

The book all through is interesting, useful, and full of suggestive remarks ; *e.g.*, "I have found upon many occasions that the lowest temperature occurs very generally between the hours of nine and ten in the evening, and subsequently shows a tendency to rise without falling again during the night. It is quite possible that this feature obtains generally upon high ground." Yes, very probably ; if so, how desirable to get a thermograph, and to determine the hourly corrections.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1885.

| STATIONS. (Those in italics are South of the Equator.) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | TotalRain. Depth. | TotalRain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 72·8 | 20 | 29·3 | 4 | 58·4 | 39·7 | 39·2 | 73 | 112·8 | 22·3 | 2·32 | 11 | 5·7 |
| Malta | 74·2 | 8 | 47·8 | 2 | 67·3 | 53·6 | 51·8 | 76 | 130·3 | 40·8 | ·59 | 6 | 3·2 |
| *Cape of Good Hope* | 90·4 | 14 | 41·0 | 24 | 72·3 | 52·8 | ... | ... | ... | ... | 1·92 | 10 | 5·0 |
| *Mauritius* | 83·8 | 13 | 65·0 | 26 | 82·2 | 71·7 | 68·0 | 76 | 134·5 | 53·1 | 1·41 | 12 | 4·7 |
| Calcutta | 105·3 | 15 | 69·6 | 26 | 100·0 | 76·0 | 71·1 | 63 | 159·5 | 43·3 | ·66 | 3 | 2·3 |
| Bombay | 89·5 | 17 | 73·7 | 9 | 86·0 | 75·5 | 71·6 | 74 | 144·3 | 64·0 | ·00 | 0 | 1·1 |
| Ceylon, Colombo | 92·4 | 26 | 71·8 | 1 | 89·9 | 75·2 | 71·5 | 70 | 145·0 | 59·5 | 3·60 | 11 | 3·4 |
| *Melbourne* | 83·6 | 4 | 40·0 | 30 | 66·4 | 49·4 | 48·4 | 74 | 137·0 | 32·1 | 2·52 | 9 | 5·8 |
| *Adelaide* | 85·2 | 10 | 46·2 | 29 | 72·3 | 53·8 | 47·3 | 55 | 143·1 | 34·9 | ·97 | 8 | 4·0 |
| *Wellington* | 68·0 | 1 | 40·0 | 24 | 61·7 | 48·6 | ... | ... | 130·0 | 36·0 | 2·76 | 11 | ... |
| *Auckland* | 70·0 | 8*a* | 48·0 | 24*b* | 65·8 | 53·2 | 49·8 | 71 | 140·0 | 38·0 | ·54 | 12 | 4·6 |
| Jamaica, Kingston | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Barbados | 83·0 | 25 | 68·0 | 7*c* | 80·0 | 71·0 | 70·2 | 75 | 144·0 | ... | ·85 | 8 | 5·0 |
| Toronto | 67·3 | 23 | 17·8 | 9 | 45·7 | 28·8 | 30·6 | 73 | 120·0 | 7·5 | 3·05 | 11 | ... |
| New Brunswick, Fredericton | 76·8 | 24 | 13·7 | 11 | 48·9 | 27·7 | 27·0 | 65 | ... | ... | 2·69 | 9 | 4·4 |
| Manitoba, Winnipeg | 66·0 | 28 | −9·0 | 2 | 45·6 | 25·4 | 30·0 | 77 | ... | ... | 1·82 | 11 | 6·5 |
| British Columbia, Victoria | 70·0 | 11 | 30·0 | 18 | 57·8 | 37·0 | ... | ... | ... | ... | ·53 | 5 | ... |

*a* And 20. *b* And 25. *c* And 8, 9, 13.

### Remarks, April, 1885.

Malta.—Mean temp., 59°·5; mean hourly velocity of wind, 10·5 miles; sea temp. rose from 61° to 64°; TS on 11th, L on 3rd, 4th, and 17th. J. Scoles.

*Cape of Good Hope.*—Max. temp. 0°·7 above average; min. temp. 1°·4 below average. W. Ellerton Fry.

*Mauritius.*—Rainfall 4·10 in. below average; mean temp. equal to average; prevailing wind S.E. to E. by S.; mean hourly velocity 2·3 miles below average, extremes 22·5 miles on 30th, and 1·6 miles on 28th. T on three days, L on 5. C. Meldrum, F.R.S.

*Colombo.*—TSS on 6 days, and L on 7 other days. J. H. Symonds.

*Melbourne.*—Rainfall ·30 in., pressure ·128 in., and humidity 1 above the average; mean temp. of air 1°·5, and of dew point 1°·1, and amount of cloud 0·1 below average; prevailing winds S.W. and S., strong on 3 days; heavy dew on 12 days, dense fog on 4. R. L. J. Ellery, F.R.S.

*Adelaide.*—Mean temp. (63°·0) 1°·4 below average; mean pressure ·102 in. above average, and the highest during 28 years. The weather of the latter half of the month was delightful, the temp. not exceeding 80°, the sky being unusually free from cloud, and the atmosphere pleasantly humid. W. E. Cooke.

*Wellington.*—From 1st to 17th fine, bright, and pleasant, with moderate winds from N.E. and S.E.; from 17th to 20th wet and stormy from S.E.; thence to 28th generally fine, bright, and cold; last two days wet. Mean temp. (55°·1) 2°, and rainfall ·85 in. below average. R. B. Gore.

*Auckland.*—A fine month with rainfall less than one-seventh of the average of 18 years; pressure above the average, mean temp. considerably below it. T. F. Cheeseman.

Barbados.—Rainfall 65 per cent. below the average; mean temp. (75°) average; wind N.E. on 28 days, mean hourly velocity 14·2 miles, extremes 18·3 miles and 8·1 miles; the whole month was cloudless; severe drought after the 16th. R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 4·11 | XI. | Rhayader, Nantgwillt.. | 10·05 |
| ,, | Margate, Birchington... | 4·30 | ,, | Carno, Tybrith ... ..... | 8·01 |
| ,, | Littlehampton ..... | 3·70 | ,, | Corwen, Rhug ..... | 6·60 |
| ,, | Hailsham ..... | 4·84 | ,, | Port Madoc ..... | 6·27 |
| ,, | I. of W., St. Lawrence. | 3·73 | ,, | I. of Man, Douglas ..... | 4·62 |
| ,, | Alton, Ashdell..... | 4·27 | XII. | Stoneykirk, Ardwell Ho. | 2·31 |
| III. | Winslow, Addington ... | 3·86 | ,, | Melrose, Abbey Gate .. | 3·42 |
| ,, | Oxford, Magdalen Col... | 3·89 | XIII. | N. Esk Res. [Penicuick] | 2·50 |
| ,, | Northampton ..... | 3·41 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | 4·28 | ,, | Glasgow, Queen's Park. | 2·79 |
| ,, | Wisbech, Bank House.. | 4·88 | XV. | Islay, Gruinart School.. | 3·58 |
| IV. | Southend ..... | 3·45 | XVI. | St. Andrews, Newton Bk | ... |
| ,, | Harlow, Sheering ... .. | 3·82 | ,, | Balquhidder, Stronvar.. | 5·95 |
| ,, | Rendlesham Hall ..... | 5·04 | ,, | Dunkeld, Inver Braan.. | 2·40 |
| ,, | Diss ..... | 4·86 | ,, | Dalnaspidal H.R.S. ... | 5·24 |
| ,, | Swaffham ..... | 5·57 | XVII. | Keith H.R.S. ..... ..... | 3·54 |
| V. | Salisbury, Alderbury ... | 3·71 | ,, | Forres H.R.S. ..... ... | 2·13 |
| ,, | Warminster ..... | 3·96 | XVIII. | Strome Ferry H.R.S.... | 6·72 |
| ,, | Calne, Compton Bassett | 4·31 | ,, | Lochbroom ..... | 7·71 |
| ,, | Ashburton, Holne Vic.. | 9·70 | ,, | Tain, Springfield..... | 1·92 |
| ,, | Holsworthy, Clawton... | 7·00 | ,, | Loch Shiel, Glenaladale | 9·96 |
| ,, | Hatherleigh, Winsford. | 8·28 | ,, | Invergarry ..... | 5·97 |
| ,, | Lynmouth, Glenthorne. | 5·68 | XIX. | Lairg H.R.S. ..... | 4·67 |
| ,, | Probus, Lamellyn ..... | 8·69 | ,, | Forsinard H.R.S. ..... | 4·15 |
| ,, | Wincanton, Stowell Rec. | 4·53 | ,, | Watten H.R.S. ..... | 3·29 |
| ,, | Wells, Westbury..... | 5·74 | XX. | Dunmanway, Coolkelure | 4·69 |
| VI. | Bristol, Clifton ..... .. | 4·53 | ,, | Fermoy, Gas Works ... | 2·52 |
| ,, | Ross ..... | 2·75 | ,, | Tralee, Castlemorris ... | 4·41 |
| ,, | Wem, Sansaw Hall..... | 5·04 | ,, | Tipperary, Henry Street | 4·68 |
| ,, | Cheadle, The Heath Ho. | 6·05 | ,, | Newcastle West ..... | 5·74 |
| ,, | Worcester, Diglis Lock | 3·51 | ,, | Miltown Malbay..... | 3·97 |
| ,, | Coventry, Coundon ..... | 4·32 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 6·34 | XXI. | Carlow, Browne's Hill.. | 2·95 |
| ,, | Ketton Hall [Stamford] | 5·42 | ,, | Navan, Balrath ..... | 4·03 |
| ,, | Horncastle, Bucknall ... | 4·95 | ,, | Mullingar, Belvedere ... | 2·88 |
| ,, | Mansfield, St. John's St | 6·64 | ,, | Athlone, Twyford ..... | 3·77 |
| VIII. | Macclesfield, The Park. | ... | XXII. | Galway, Queen's Col.... | 4·95 |
| ,, | Walton-on-the-Hill..... | 6·62 | ,, | Clifden, Kylemore ..... | 6·16 |
| ,, | Lancaster, South Road. | 3·59 | ,, | Crossmolina, Enniscoe.. | 6·05 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 3·69 |
| IX. | Wakefield, Stanley Vic. | 3·15 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 5·37 | ,, | Rockcorry..... | 3·47 |
| ,, | Scarborough..... | 4·86 | ,, | Warrenpoint ..... | 3·20 |
| ,, | East Layton [Darlington] | 5·45 | ,, | Newtownards ..... | 2·40 |
| ,, | Middleton, Mickleton .. | 4·60 | ,, | Belfast, New Barnsley . | 4·53 |
| X. | Haltwhistle, Unthank.. | 3·77 | ,, | Cushendun ..... | 5·08 |
| ,, | Shap, Copy Hill ..... | 6·13 | ,, | Bushmills ..... ..... | 3·55 |
| XI. | Llanfrechfa Grange . ... | 4·49 | ,, | Stewartstown ..... | 3·18 |
| ,, | Llandovery ..... | 5·96 | ,, | Buncrana ..... | 4·95 |
| ,, | Castle Malgwyn ..... | 5·33 | | | |

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# OCTOBER, 1885.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches | inches. | in. | | | | | | | | |
| I. | London (Camden Square) ... | 3·73 | + 1·03 | ·98 | 23 | 17 | 60·9 | 3 | 33·4 | 12 | 0 | 5 |
| II. | Maidstone (Hunton Court)... | 3·76 | + 1·30 | 1·24 | 23 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | Strathfield Turgiss ..... | 3·70 | + ·96 | ·77 | 23 | 17 | ... | ... | ... | ... | ... | ... |
| III. | Hitchin ..... | 4·99 | + 2·81 | ·87 | 23 | 18 | 56·0 | 2 | 30·0 | 29 | 2 | ... |
| ,, | Banbury ..... | 3·67 | + ·91 | ·65 | 30 | 22 | 58·0 | 3*a* | 30·0 | 30 | 2 | ... |
| IV. | Bury St. Edmunds (Culford) | 4·76 | + 2·59 | 1·02 | 6 | 24 | 62·0 | 1 | 29·0 | 11*c* | 5 | ... |
| ,, | Norwich (Cossey)..... | 6·86 | + 4·53 | 1·22 | 13 | 25 | 61·0 | 16 | 30·5 | 30 | 1 | 10 |
| V. | Weymouth(LangtonHerring) | 3·99 | ... | ·63 | 21 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | Barnstaple..... | 5·68 | + ·23 | ·73 | 30 | 23 | 60·0 | 19 | 39·0 | 25 | 0 | ... |
| ,, | Bodmin ..... | 7·56 | + 1·29 | ·72 | 30 | 28 | 55·0 | 2*b* | 37·0 | 13 | 0 | 1 |
| VI. | Stroud (Upfield) ..... | 2·95 | — ·06 | ·49 | 23 | 18 | 60·0 | 4 | 32·0 | 11 | 1 | ... |
| ,, | ChurchStretton(Woolstaston) | 5·62 | + 1·02 | 1·20 | 6 | 26 | 57·5 | 25 | 34·0 | 12 | 0 | 3 |
| ,, | Tenbury (Orleton) ..... | 4·04 | + ·80 | ·96 | 23 | 23 | 59·0 | 16 | 27·3 | 12 | 5 | 7 |
| VII. | Leicester ... ..... | 5·44 | ... | 1·25 | 23 | 23 | 63·8 | 16 | 30·2 | 30 | 2 | 14 |
| ,, | Boston ..... | 4·89 | + 2·86 | 1·54 | 23 | 23 | 57·0 | 16 | 33·0 | 12 | 0 | ... |
| ,, | Grimsby (Killingholme)..... | 6·42 | + 3·77 | 2·11 | 23 | 28 | 57·0 | 2 | 35·0 | 12*f* | 0 | ... |
| ,, | Hesley Hall [Tickhill]..... | 4·55 | ... | 1·26 | 23 | 23 | 59·0 | 4 | 30·0 | 30 | 2 | ... |
| VIII. | Manchester (Ardwick)..... | 5·52 | + 1·09 | ·75 | 30 | 24 | 58·0 | 2 | 32·0 | 12 | 1 | ... |
| IX. | Wetherby (Ribston Hall) ... | 4·82 | + 1·46 | ·99 | 24 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | Skipton (Arncliffe) ..... | 7·47 | + ·21 | 1·11 | 4 | 25 | 53·0 | 17 | 31·0 | 29 | . | ... |
| X. | North Shields ..... | 4·56 | + 2·05 | ·62 | 10 | 22 | 62·5 | 1 | 33·0 | 21*g* | 0 | 2 |
| ,, | Borrowdale (Seathwaite)..... | 12·79 | — 3·76 | 2·10 | 25 | 23 | 55·9 | 15 | 27·9 | 12 | 1 | ... |
| XI. | Cardiff (Ely)..... | 6·15 | + ·92 | 1·13 | ·9 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | Haverfordwest ..... | 7·42 | + ·97 | 1·20 | 21 | 20 | 58·0 | 1*c* | 30·0 | 17*h* | 2 | 2 |
| ,, | Plinlimmon (Cwmsymlog) ... | 6·90 | ... | 1·47 | 6 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | Llandudno..... | 4·65 | + ·06 | ·89 | 6 | 20 | 58·1 | 2 | 36·0 | 12 | 0 | ... |
| XII. | Cargen [Dumfries] ..... ... | 4·44 | — 1·27 | ·74 | 4 | 16 | 55·0 | 2*d* | 26·0 | 25 | 4 | ... |
| ,, | Jedburgh (Sunnyside)..... | 2·27 | — ·40 | ·44 | 4 | 23 | 57·0 | 2 | 29·0 | 13*i* | 6 | ... |
| XIV. | Douglas Castle (Newmains) | 3·80 | — 1·14 | ·95 | 4 | 16 | ... | ... | ... | ... | ... | ... |
| XV. | Lochgilphead (Kilmory)..... | 5·58 | — 2·74 | ·90 | 4, 25 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | Oban (Craigvarren) ..... | 4·06 | ... | ·60 | 25 | 18 | 58·5 | 15*k* | 31·0 | 22 | 3 | ... |
| ,, | Mull (Quinish)..... | 5·13 | ... | 1·02 | 25 | 21 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices ..... | 1·70 | — 2·61 | ·50 | 31 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | Arbroath ..... | 1·52 | — 1·35 | ·46 | 30 | 11 | 55·0 | 1, 5 | 29·0 | 25 | 4 | ... |
| XVII. | Braemar ..... | 3·26 | — 1·22 | ·57 | 12 | 24 | 53·0 | 2 | 17·0 | 25 | 11 | 20 |
| ,, | Aberdeen ..... | 2·21 | ... | ·50 | 25 | 20 | 56·0 | 1, 2 | 26·0 | 22 | 5 | ... |
| XVIII | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | Culloden ..... | 1·58 | — ·71 | ... | ... | ... | 56·0 | 2 | 22·0 | 23 | 8 | 15 |
| XIX. | Dunrobin ..... | 3·37 | ... | ·57 | 25 | 18 | 56·0 | 2 | 28·0 | 25 | 5 | ... |
| ,, | Orkney (Sandwick)..... .. | 4·67 | + ·38 | ·90 | 2 | 23 | ... | ... | ... | ... | ... | ... |
| XX. | Cork (Blackrock)..... | 2·74 | — 2·00 | ·66 | 29 | 23 | 60·0 | 3, 6 | 33·0 | 24 | 0 | ... |
| ,, | Dromore Castle ..... | 6·99 | ... | ·99 | 25 | 21 | 65·0 | 25 | 31·0 | 22 | ... | ... |
| ,, | Waterford (Brook Lodge) ... | 4·43 | ... | ·63 | 29 | 17 | 58·0 | 8 | 33·0 | 23 | 0 | 9 |
| ,, | Killaloe ..... | 4·50 | ... | ·56 | 20 | 22 | 58·0 | 8 | 32·0 | 22*g* | 2 | ... |
| XXI. | Portarlington ..... ..... | 2·92 | — ·55 | ·51 | 5 | 23 | 56·0 | 3 | 34·0 | 24 | 0 | ... |
| ,, | Dublin (FitzWilliam Square) | 3·50 | + ·08 | ·99 | 6 | 22 | 57·1 | 2 | 33·2 | 25 | 0 | 9 |
| XII. | Ballinasloe ..... ..... | 3·63 | — ·80 | ·66 | 6 | 18 | 52·0 | 17 | 30·0 | 22*g* | 4 | ... |
| XIII | Waringstown ..... | 3·22 | — ·39 | ·42 | 25 | 22 | 60·0 | 1 | 26·0 | 24 | 3 | 10 |
| | Londonderry (Creggan Res.). | 4·95 | ... | ·80 | 4 | 27 | ... | ... | ... | ... | ... | ... |
| | Omagh (Edenfel) ..... | 3·45 | — ·87 | ·48 | 25 | 20 | 55·0 | 17 | 31·0 | 24 | 2 | 4 |

ENGLAND. WALES. SCOTLAND. IRELAND.

4, 16. *b* And 3, 5, 6. *c* And 2, 4, 6. *d* And 3, 7, 15. *e* And 29. *f* And 28.
*g* And 25. *h* And 24. *i* And 25, 30. *k* And 24.

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# METEOROLOGICAL NOTES ON OCTOBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The heavy rains at the beginning and close of the month stopped the sowing of wheat, which was but irregularly done all through the month.

HITCHEN.—Since July, which had an average temperature, we have had the coldest August, the coldest but two September, and the coldest but one October since the record commenced in 1849.

BANBURY.—Mean temp. (44°·8) 4°·5 below the average; fog on 5 days, high wind on 5 days, H on 27th.

CULFORD.—A most uncomfortable month, with continuous drenching rains which delayed the storing of the mangold crop and all out-door work.

COSSEY.—A very cold and wet month.

LANGTON HERRING.—Rainfall ·42 in. above the average of ten years; mean temp. three degrees below the average, and with the exception of 1880 and 1881 the lowest in October during 14 years; the max. temp. was also the lowest in that period. The 9th and 10th were very stormy, the lowest pressure recorded this year occurring on 10th.

BODMIN.—Mean temp. 48°·0.

STROUD.—A very wet and cold October; dense fog on morning of 17th.

WOOLSTASTON.—A cold, stormy month with constant R; mean temp. 43°·8.

ORLETON.—A very cold and rainy month with a few fine days; mean temp. more than 4° below the average of 25 years, and lower than that of any October in that period except 1880; there were several frosty mornings but not severe, and the temp. was uniformly low; fluctuations in pressure were rapid and frequent, wind frequently very strong, especially on 27th; dense fog on morning of 17th; L on 27th and 28th.

LEICESTER.—The month was a very wet one with some very cold nights, the min. on grass twice falling to 22°.

KILLINGHOLME.—A month of almost incessant R, the fall of the 23rd being the heaviest ever recorded here, and the total for the month having been approached only by that of December, 1867, when 6·22 in. fell on 29 days.

MANCHESTER.—A wet month, the R being both heavy and constant; occasional frosts at night, and two or three foggy mornings; T on 5th, severe T and H on 27th.

## WALES.

HAVERFORDWEST.—The first half of the month was but a continuance of the excessive wet of the previous one, accompanied frequently at night by H, T, and L; from 15th to 20th fine weather prevailed with slight frosts; a stormy, wet period again set in on 21st, continuing, with a slight break of three days, to the end. Although it blew very strongly at times from N.W. and N.N.E., there were no violent gales. Mean temp. about the average; scarcely any frost.

## SCOTLAND.

CARGEN.—The beginning and end of the month were very stormy and wet, and it was the coldest October for many years; mean temp. (44°·0) 4°·4 below the average.

JEDBURGH.—The month was distinguished by the number of days on which R fell, and the prevalence of cold N. and N.E. winds. The weather was cold and ungenial, and owing to the frost and wet, deciduous trees were quite bare at the close; root crops still improving; cereals all secured in good order.

OBAN.—Rainfall moderate, and temp. low, but the weather was seasonable, and the potatoe crop both plentiful and well saved.

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QUINISH.—Wet and stormy from 1st to 8th, and from 25th to 30th; sharp frost from 21st to 24th, which broke up on 25th, with very heavy R from S.E. A very bad harvest was finished in this district about the middle of the month, very little grain being left in the sheaves, but the straw in fair order.

BRAEMAR.—A very unsettled month, cold and wet, and the hills covered with fresh S; grass temp. on 25th as low as 9°.

ABERDEEN.—Rainfall of the month about three quarters of an inch below the average; otherwise nothing remarkable to record. Lunar halo on 22nd; H on two days.

CULLODEN.—The weather during the month was unsettled, but there were considerable intervals of dry and favourable harvest weather, which allowed the crops to be safely gathered, except in the Highlands, where they suffered greatly from frost; potatoes free from blight, and an average yield.

## IRELAND.

DROMORE.—The beginning of the month was wild and cold, with N.E. winds; the latter part was mild with N.W. winds.

WATERFORD.—A very wet and wild month. S on Mount Leinster on 11th; thick fog on 18th and 19th

KILLALOE.—The general character of the month was normal, and the rainfall was about the average; winds moderate; mean temp., 46°·1, rather lower than usual.

DUBLIN.—A very cold, unsettled, and rainy month, polar winds predominating largely; H showers frequent. Mean temp. (44°·6) 4°·6 below the average, and nearly as low as that of October, 1880 (44°·5), which was the coldest October in 20 years. L on 12th; T on 23rd; lunar halo on 20th; fog on five days. Mean humidity, 88; prevailing winds, N.W.

EDENFEL.—The cold, wet, and unsettled weather which commenced on September 1st did not terminate till October 14th, during which time there were but three rainless days. A fine, calm, and mostly clear period of 11 days, however, followed, enabling what remained of the cereals to be rescued, and the heaviest and soundest crop of potatoes since 1846 to be dug and stored in excellent order. From 25th to 31st the weather was again wet and squally.

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## PRE-INSTRUMENTAL METEOROLOGY.

WE have never swerved from the opinion expressed many years since in this magazine that considerable service would be rendered to meteorology by the collection of old weather records. We are glad to find evidence that our neighbours in France are of the same opinion. The last number of the *Annuaire de la Soc. Mét. de France*, contains a copy of such records from 1584 to 1781, extracted from the records of the church of Notre Dame de Tonnerre (Yonne), about 100 miles S.E. of Paris. We should be very glad to receive and publish analogous excerpts from British Parish registers.

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## METEOROLOGICAL BIBLIOGRAPHY.

WE think that it will be of general interest to state what progress has been made by the United States Signal Office with the preparation of the catalogue of books and papers upon Meteorology.

The articles upon the subject which have appeared in this Magazine * have described Mr. Symons's share in the work, and render it unnecessary to do more than give the references to them for the use of any one who desires to refer to the early history of the subject.

With the permission of General Hazen we proceed to explain the progress which has subsequently been made at the Signal Office, and through his influence.

First and most important of all, Dr. Hellmann has consented to the incorporation of all the works (about 5,200) quoted in his splendid *Repertorium*.

Dr. Hann is preparing a catalogue of the library of the central Anstalt at Vienna.

Prof. Wild forwarded a catalogue of 280, and Prof. Woeikof one of 310, contributions to meteorology.

Dr. Mohn has furnished a similar list for Norway.

A valuable collection of 196 titles has been received from the Royal Library, Copenhagen.

Polish literature will be represented by titles extracted from Zebrawski's *Bibliografia*, Krakau, 1873, completed by titles furnished by Dr. Karlinski.

Senor Merino, of the Madrid Observatory, has kindly undertaken to collect Spanish material.

Dr. J. C. de Brito Capello, of the Lisbon Observatory, has rendered important help.

Dr. Neumayer has furnished a catalogue of the library of the Deutsche-Seewarte, including the important library of Prof. Dove.

Mr. Ellery forwarded a complete bibliography of Victorian Meteorological publications.

Mr. C. Amnerstedt, Librarian of the Upsala University Library,

* Vol. XVII. (1882), p. 1 and 129; Vol. XVIII. (1883), p. 97 and 135.



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sent 337 Swedish titles of dates earlier than those published by Fineman.

In completion of the Royal Society Catalogue, the most important periodicals have been indexed from 1874, and 5,000 new titles have already been obtained from this source. Reuss's *Repertorium Commentationum* (about 2,500 titles) has been copied; also Poggendorff's *Handwörterbuch* (about 1,000), Dähuert's *Greifswald Catalogue*, the Royal Society *General Science Catalogue*, Zuchold's *Bibliotheca-Naturalis*, May's *Bibliography of Electricity*, and many others.

The total number of titles now in the office is about 48,000, and although these doubtless contain some duplicates, it must, on the other hand, be recollected that as the catalogue is to be a *subject* ca ogue, many books must be entered twice.

When it is remembered that the Catalogue of the Library of the Royal Meteorological Society (1876) contained only 1,214 entries, one gets an approximate idea of what a great work the Washington Catalogue will be with about forty times that number.

We understand that although the collecting is almost finished, and the classification has been commenced, there is still time for the reception of additional material if any of our readers have fresh titles to send, because Congress has not yet voted the funds for publication. We, however, refuse to believe for a moment that Congress will in this respect depart from the generous views which it has always held respecting the diffusion of useful knowledge.

## THE BIELA METEORS.

On or about November the 18th, the following circular was issued from Lord Crawford's Observatory, Dun Echt, Aberdeenshire:—

"Considering the great uncertainty which envelopes the fate of Biela's comet, it seems desirable to call to mind that about midnight on the 27th inst. the earth will be in the path of the meteors seen to radiate from near $\gamma$ Andromedæ on November 22, 1872. The comet's periodic time, and presumably that of the meteors, being about 6·6 years, nearly two periods will have elapsed since the meteoric shower of 1872. If, therefore, the meteors are very widely distributed along the comet's orbit, there is a chance that they may again appear in considerable numbers this year. In 1892, and still more in 1905, there is a probability of a return of the display of 1872."

As regards the complete fulfilment of this anticipation, we print *in extenso* two notes with which we have been favoured, and at the end of them an epitome of such other information as has come to hand.

*To the Editor of the Meteorological Magazine.*

Sir,—The display to which attention was drawn by circular from Dun Echt took place on the 27th, but earlier in the evening than was anticipated. It commenced soon after dusk and lasted till 9 p.m., when clouds and rain prevented further observations. Ten time

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records were taken at intervals at Guildown, and three other local ones have been communicated to me. At times the stars fell almost continuously, and occasionally three or four at a time. As the result of actual countings of portions of the sky, the estimated general rate for all parts was found to be as follows :—

| | | | |
|---|---|---|---|
| 6 | P.M., | 10 | per minute. |
| 7.20 | ,, | 22 | ,, |
| 7.50 | ,, | 29 | ,, |
| 8.30 | ,, | 25 | ,, |
| 9 0 | ,, | 26 | ,, |

A few of the observations when the shower was thickest gave 40 to 50 per minute.

Except for a short interval about 7.30, there was always cloud and mist to some degree, so that the countings and estimates are possibly under the mark. The estimated proportion of large meteors was 1 in 10. These were white with long yellow or reddish-yellow trails, and 3 to 4 times the size and brightness of Jupiter. The intermediate ones in size also were white. The smaller stars often appeared of a bluish and some of a yellow or yellow-red tint. A considerable proportion of the meteors were referred to the radiant point, but frequently they were scattered all over the sky, and not so easily traced. At intervals they seemed more numerous in particular quarters, notably E. and W., and two observers towards different points would differ considerably in their countings. The numbers observed overhead did not seem larger than elsewhere. At 9 p.m. on the 28th three large ones were observed.

J. RAND CAPRON.

*Guildown, Nov* 28, 1885.

*To the Editor of the Meteorological Magazine.*

SIR,—Last evening (November 27th) a grand display of meteors occurred here. The sky at the time had some light clouds towards the south, but these shortly cleared away, leaving it intensely clear.

At 5.45 (5.1 p.m. G.M.T.) it became suddenly alive, with meteors falling to all points of the horizon from the small star $\gamma$ Andromedæ; their motion was slow, giving one the idea of flakes of snow falling in a calm. Some were very minute, barely visible; others as large as Jupiter or Venus. The latter travelled rapidly, leaving luminous red streaks in their path, lasting in some cases more than half a minute—long enough to determine their direction to the above-named star. Great numbers, and these of considerable size, but slow motion, came into view within a degree or two only of the horizon.

At 7.30 ( = 6.46 p.m. G.M.T.) they diminished gradually in number. Sky clouded from 8 to 9.30 ( = 7.16 to 8.46 p.m. G.M.T.), but the meteors were seen in the intervals between the clouds.

At 9.30 ( = 8.46 p.m. G.M.T.) the sky was again cloudless; meteors were still falling, though less in number, on all sides.

At midnight there were only occasional ones, and these chiefly in the west.

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At first, counting was quite impossible, but at 6.25 (=5.41 p.m. G.M.T.) I was able to count 104 between the N. and N.W. points in one minute; my daughter counting 60 in the opposite quarter, and another counting 39 from the radiating point in the same time.

At 10 p.m. (=9.16 p.m. G.M.T.) I counted from the radiating point 20; at 11 p.m. (=10.16 p.m. G.M.T.) 7; and at midnight (=11.16 p.m. G.M.T.) 2 meteors.

I have seen nothing like it since the shower of 1866.

Faithfully yours,

MICHAEL FOSTER WARD.

*Partenkirchen, Bavaria, Nov.* 28, 1885.

We have from Bavaria (12° E.) to Bristol (3° W.), and from Tunis (38° N.) to Inverary (56° N.), notes of the shower, but the prevalence of cloud renders it very difficult to determine the epoch of maximum number, and the rate of increase and decrease towards that maximum. It is quite certain that by 9 p.m. local time the numbers were decreasing everywhere. It is almost equally certain that the numbers were increasing from 5 p.m. to 6 p.m. local time. In a very interesting note in *Ciel et Terre*, the time of maximum is given for Brussels as 6 p.m. local time (5h. 43m. G.M.T.); but at Liége, within a few miles of Brussels, they are said to have been falling at the rate of 1,800 an hour at 8 p.m. local time (7h. 45m. p.m. G.M.T.) At Clermont (in Central France) the shower lasted from 6 till 9 p.m., and at 7 p.m. local (7h. 6m. G.M.T.) meteors were falling at the rate of 3,000 an hour.

In England, the observations were much interrupted by cloud, but one of the best observers (Mr. Denning, of Bristol,) found the number increase gradually from 5 till 6.35 p.m., when clouds prevented further observations. It may, therefore, be taken as certain, that at Bristol the max. did not occur before 6.30 p.m. The only report which we have yet seen from Greenwich implies a decrease from 6 p.m. onwards, but possibly full details may modify this. We think that the absolute maximum occurred at about 6.30 p.m. local time, and a very important secondary maximum between 8 and 8.10 p.m. local time.

As regards the maximum number, there is also great discordance, but three good records agree closely. M. Thirion, of Louvain, in *Ciel et Terre*, gives 193 per minute as the maximum (at 6.48 p.m. local time), counted by two observers standing back to back, *i.e.*, a total of nearly 12,000 an hour. Mr. Denning gives 5,000 an hour for *one* observer, or 10,000 an hour for two; and Col. Ward's figures also work out to about 12,000. Most records are, however, much below this, and, indeed, we are rather puzzled to know how this rapid counting is done, except where, as at our own station, a recording chronograph is available, for 5,000 an hour for one observer implies an average of $1\frac{1}{2}$ in each second, and as they do not fall uniformly, it may be said to be somewhat nearer three in one second and none in the next.

In magnitude and in their tails they were far inferior to the Leonid's of November, 1866. Very few were equal to or greater

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than a first magnitude star, and not one tail remained long enough for a telescope to be turned on to it; whereas, in 1866, most of them were brighter than Sirius, and the tails were visible for minutes instead of seconds—several for 10 minutes and one for 14 minutes.

P.S. Our American contemporary, *Science*, of December 4th, reports that at George Town, D.C., Lat. 38° 55′ N., Lon. 77° 0′ W., a considerable shower was seen between 6.30 and 7.50 p.m. on 27th, [= 11.38 p.m. and 0.58 a.m. on 28th G.M.T], and four observers counted as follows:—

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | a.m. 28th. | | | | |
| 100 | between | 7.0 & 7.30 | = | 100 | between | 0.8 & 0.38 | G.M.T. | = | 200 | per hour. |
| 100 | ,, | 7.30 & 7.55 | = | 100 | ,, | 0.38 & 1.3 | ,, | = | 240 | ,, |
| 100 | ,, | 7.55 & 8.38 | = | 100 | ,, | 1.3 & 1.46 | ,, | = | 140 | ,, |
| 28 | ,, | 8.38 & 9.0 | = | 100 | ,, | 1.46 & 2.8 | ,, | = | 76 | ,, |

## ROYAL METEOROLOGICAL SOCIETY.

The Opening Meeting of the Session was held on Wednesday evening, the 18th November, at the Institution of Civil Engineers, 25, Great George Street, Mr. R. H. Scott, F.R.S., President, in the chair.

Messrs. F. R. H. Clunn, R. S. Davies, B.A., H. C. Fox, M.R.C.S., W. E. Jackson, J. Richardson, M.Inst.C.E., F.G.S., A. L. Rotch, and C. Todd, C.M.G., were elected fellows of the Society.

The following papers were read:—

(1). "The Helm Wind of August 19th, 1885," by William Marriott, F.R.Met.Soc. This wind is peculiar to the Cross Fell range, Cumberland, and is quite local but very destructive. The chief features of the phenomenon are the following:—On certain occasions when the wind is from some easterly point the Helm suddenly commences. At first a heavy bank of cloud rests along the Cross Fell range—at times reaching some distance down the western slopes, and at others hovering about the summit—then at a distance of one or two miles from the foot of the Fell there appears a roll of cloud suspended in mid-air and parallel with the Helm Cloud; this is the Helm Bar. A cold wind rushes down the sides of the Fell and blows violently till it reaches a spot nearly underneath the Helm Bar, where it suddenly ceases. The space between the Helm Cloud and the Bar is usually quite clear, blue sky being visible: at times, however, small portions of thin vaporous clouds are seen travelling from the Helm Cloud to the Bar. The bar does not appear to extend further west than the river Eden. The author visited the district in August last, and was fortunate enough to witness a slight Helm. He gave a detailed account of what he experienced, and also observations on the temperature of the air at the summit and base of Cross Fell, the direction and force of the wind, the movement of the clouds, &c.

(2). "The Typhoon origin of the Weather over the British Isles during the second half of October, 1882," by Henry Harries. The

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author shows by means of daily charts, that a Typhoon which originated near the Phillipine Islands on September 27th, 1882, passed over Japan and the Aleutian Archipelago, entering the United States on October 10th. Crossing the Rocky Mountain range it proceeded through the Northern States and Canada to Labrador and Davis Strait. In the Atlantic it was joined on Oct. 18th by another disturbance which had come up from the Atlantic Tropics, the junction of the two being followed by a cessation of progressive movement from the 19th to the 25th. During this period the severe gale which passed along our southern counties on the morning of the 24th was formed, its sudden arrival upsetting the Meteorological Office forecasts of the previous night. Observations are quoted, showing that it would have been impossible for the Department to have been aware of its existence before about 3 a.m. of the 24th. Following in the wake of this storm the parent cyclone reached the French coast on the 27th, its advent being marked as in Japan and America by violent gales and extensive floods over the whole of Western and Central Europe and Algeria. The village of Grindelwald was destroyed, and in the Austrian Tyrol the damage caused by floods reached at least two millions sterling. Passing through France and the Netherlands the disturbance showed signs of exhaustion, and on November 1st in the Baltic it quietly dispersed, after accomplishing a journey of more than 16,000 miles in 36 days. This is the first storm which has been followed day by day from the Pacific to Europe.

(3). "Notes as to the principle and working of Jordan's Photographic Sunshine Recorder," by J. B. Jordan and F. Gaster, F.R.Met.Soc. This instrument consists of a cylindrical dark chamber, on the inside of which is placed a prepared slip of photographic paper. The direct ray of sunlight being admitted into this chamber by small apertures in the side, is received on the sensitized paper, and, travelling over it by reason of the earth's rotation, leaves a distinct trace of chemical action whenever the light is of sufficient intensity to show a definite shadow on a sun-dial. The cylinder is mounted on a stand with adjustments for latitude, &c. The record is fixed by simply immersing it in water for a few minutes. As the instrument records the actinic or chemical rays, it usually shows a longer duration of sunshine than is obtained by the ordinary "burning" sunshine recorder, the latter recording only *bright* sunshine.

[An engraving of the first pattern of this instrument will be found on p. 38 of this volume. We think that the records of this instrument should be called sun*light*, to distinguish them from those of the burning sun*shine* instrument.—ED.]

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## REVIEWS.

*Principles of Forecasting by means of Weather Charts.* By the Hon. RALPH ABERCROMBY. Issued by the authority of the Meteoro logical Council. 8vo., viii.-124 pages. London: Stanford, 1885.

BY the clearness with which he writes, and by the avoidance of technicalities and those crooked words which deter the ordinary public from following the science of the present day, Mr. Abercromby shows himself perfectly at home in the whole subject of Meteorological Chartography and weather prediction. Any one of ordinary intelligence can follow him through the whole work, and gain a clear and common sense view of the principles of weather forecasting, and to an intelligent reader the interest is greatly enhanced by the way in which it calls up in the mind many popular prognostics, and shows that they are not only true, but the practical expression of that which this work exhibits theoretically.

He has given the clearest definitions we have yet seen of anticyclones, cyclones and other depressions, and by so doing has rendered a considerable service, which we trust that future writers will utilize by rigorously following, and thus avoid the somewhat loose employment of identical terms for different conditions.

The work, which is fully illustrated, begins by describing synoptic Charts as the basis of weather forecasting, and among their data gives the Beaufort Scale, with the equivalent velocities of wind adopted by the Meteorological Office. This scale though undoubtedly very accurate in the days of sailing ships, and probably still sufficiently so at sea, gives a very rough estimate on shore, and the equivalent velocities are perhaps the most imaginary values that remain in modern Meteorology. The next chapter explains gradients, isobars and the direction of wind in relation to isobars, cyclones and typical areas of low pressure and anticyclones and typical areas of high pressure with their general accompanying weather, and it is impressed on the reader that the wind and weather depend on the shape and intensity (*i.e.*, the steepness of the gradients) of a cyclone, and not on the level of the isobars, or, in other words, on the relative and not on the absolute pressures. Having in these chapters clearly described as it were plans of the weather for given instants of time, the author proceeds with weather sequence, describing the main features of the great areas of pressure on whose arrangement the persistence of our types of weather depends. The types are described under the headings Southerly, Westerly, Northerly and Easterly, but that they are sufficiently connected with the cardinal points of the compass to justify the nomenclature, we are not fully convinced.

We are told in the preface that the Author was by illness prevented revising the proofs, and are therefore loth to criticize, but on p. 49, a misprint of Ireland for Iceland renders the meaning somewhat obscure, and the chart and descripton thereof on p. 60 do

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not tally, reference being made to a reading of 31·1 in., which does not appear.

Following the "Types" comes a section on Recurrence, a few sentences of which we extract :—

"By 'recurrence' of type is meant the tendency of certain kinds of weather to recur about the same season of every year."

"January 14th to 20th, a great barometric surge. February 7th to 10th, a spell of cold weather associated with the Northerly type. This is the first of a series of six cold and three hot periods observed by Mr. A. Buchan, and described by him.* The method adopted by him was to note the irregular flexures in the general sweep of the annual temperature curve. He found their recurrence so regular that he says, 'During the last 50 years some of them appeared every 'year between the dates specified, and none failed to make their 'appearance on more than five years.'"

"April 11th to 14th, a cold spell. Buchan's second period, which he has identified with the popular 'weather saw' of the 'borrowing days.' These are three cold days which March is said to borrow from April, allowing for the difference of the old and new style of reckoning the calendar

"May 9th to 14th, a cold spell. Buchan's third period. This is the most celebrated of the cold periods, as it occurs over all Europe, and has been the subject of many wild theories. The saints to whom these days are dedicated in the German calendar have been popularly called 'the Frost Saints.' This cold spell is also known as 'Maedler's cold days,' from the name of an investigator."†

"July 12th to 15th, a warm period; Buchan's first. July 15th, St. Swithin. The popular legend of this saint, and other rainy saints like St. Méchard [? Médard], receives an easy explanation from synoptic charts. Roughly speaking, the weather at the end of July is influenced by one of two types; either the Westerly of considerable intensity, which would be rainy, or the Northerly type, which would be dry. If, then, there is either a rainy or a dry spell about the 15th, similar weather may be expected to last for some time after, if not for 40 days.

"August 2nd to 8th, a wet period; the 'Lammas floods' of Scotland. 6th to 11th, a cold period; Buchan's fifth. 12th to 15th, a hot period; Buchan's second."

The first 70 pages of the book having dealt with the *materials* for forecasting, the last 50 pages are devoted to forecasting, including storm warnings. With reference to warnings telegraphed from America, the author ventures to sum up as follows :—

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* Journal of the Scottish Meteorological Society, Vol. II. (new series), pp. 4, 41 and 107.

† For some interesting details, see W. von Bezold. "Die Kälte-rückfälle, n Mai." Abhand. K. Bayer. Akademie der Wiss., II. Cl. XIV. Bd. II. Abth.

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"From all these considerations the conclusion is inevitable, that though there is an undoubted connexion between the weather on both sides of the Atlantic, the nature of the changes are so complicated and variable, that no practical use can be made of the knowledge for forecasting purposes without observations over the intervening ocean."

The section on sunspots and weather is perhaps useful in a work that is intended to be popular, though the author does not demolish the theory of their connection very vigorously; we thought that it had been long ago consigned to the limbo of fallacies.

The section on prognostics shows how useful halos, cirrus cloud, &c., may be in aiding the forecaster, especially when the indications of the synoptic charts are not clear, but recognizes the great difficulty of cirrus observations and enforces their greater value as indications of rain than of wind.

Numerous illustrations of successful and unsuccessful forecasts are given, and the reasons of their success or failure clearly shown, the effect of even a slight deviation of a cyclone from the expected track in vitiating the prediction as to direction and shift of wind is dwelt upon, and the work closes with abstracts from the summary of failures and successes worked out in the Meteorological Office which shows a percentage of complete successes of about 35 per cent., and of partial successes of about 45 per cent.

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*Anleitung zur Aufstellung von Wetterprognosen auf Grundlage der Zeitungs-Wetterkarten oder der Isobaren-Telegramme.* Von DR. J. VAN BEBBER. (Separat-Abdruck aus der von der Deutschen Seewarte herausgegebenen Monatlichen Uebersicht der Witterung, April, 1885).

THIS paper has so much in common with Mr. Abercromby's that we add a few lines in order to call attention to it. The paper has been prepared from the Daily Weather Maps issued by the German Government during the last ten years, as Dr. van Bebber says, not in order that everybody may become his own weather prophet, but to render accessible to all the usual sequences of certain typical distributions of atmospheric pressure.

The author points out that the great difficulty in the way of weather forecasting arises from uncertainty as to the direction in which the cyclonic systems are likely to move, and gives maps and tables illustrative of the facts probable according to the localities of barometric minima, and the weather to be expected in N.W., S. and E. Germany as the result.

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*Mesures des Hauteurs et des Mouvements des Nuages.* Par N. EKHOLM ET K. L. HAGSTROM (*Présenté à la Société Royale des Sciences d'Upsal*). 4to, 64 pages and 1 plate. Upsal: E. Berling, 1885.

M. HILDEBRANDSSON and his staff have long been convinced that the

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best mode of determining the heights and motions of clouds is by trigonometrical observations made simultaneously at the extremities of a suitable base line, but the difficulty lay in the identification of the object and in the simultaneous action of the two observers. The first idea was to establish telegraph instruments at each end, but the process would have been costly and slow. When the Swedish Arctic expedition to Spitzbergen was being organized the telephone had been invented, and it was resolved to prepare special theodolites for the observation of aurora borealis, and to provide telephones so that simultaneous observations of auroral phenomena could be taken. After the return of the expedition these instruments were placed at the disposal of Dr. Hildebrandsson, and arrangements were at once made for their application to cloud measurement, Messrs. Ekholm and Hagström undertaking the work. Two brick pillars with the requisite shelter-houses were provided, one at Upsala observatory, the other at about a quarter of a mile further South.

The present work describes first the instruments, then very fully the mode of calculation, and afterwards gives the results of the summer months of 1884. We must give them very briefly.

The mean height of the various forms of cloud is given in the following table.

| No. of Observations. | Cloud. | Altitude. Feet. | Miles. |
|---|---|---|---|
| 5 | Stratus | 2050 | 0·4 |
| 24 | Lower Nimbus | 3658 | 0·7 |
| 12 | Upper ,, | 7169 | 1·4 |
| 101 | Summit of Cumulus and Cumulo Stratus | 5545 | 1·1 |
| 51 | Base of ditto | 4288 | 0·8 |
| 22 | Lower Alto-cumulus | 6522 | 1·2 |
| 5 | Upper ,, ,, | 13911 | 2·7 |
| 10 | Cirro-cumulus | 18078 | 3·5 |
| 64 | Cirrus | 22346 | 4·3 |

The altitudes of the bases of cumuli are nearly constant during the middle of the day, but increase towards evening, but the altitudes of the tops increase rapidly, from a morning minimum, until 1 p.m., when they begin to decrease, but not so fast as they had previously increased.

The bases of nimbi are often within a few hundred feet of the ground, their tops as much as 1,000 ft. above it, and though there are indications that nimbi dissolve from below upwards, the evidence is uncertain.

Cirrus clouds appear to rise throughout the day, the following being the values :—

| Time | 11.30 a.m. | 1.30 p.m. | 5 p.m. | 6 p.m. |
|---|---|---|---|---|
| Altitude in miles | 3·7 | 4·1 | 4·4 | 4·7 |
| No. of observations | 15 | 10 | 12 | 27 |

The authors investigate many other points, but, as they truly remark, their series of observations was too short to afford conclusive evidence. We are glad to hear that a fresh series was to be commenced with the great advantage of a longer base line than the quarter of a mile hitherto employed.

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*Lehrbuch der Meteorologie. Im auftrage der direktion der Deutsche Seewarte bearbeitet* VON DR. A. SPRUNG. 8vo. xii,—408 pages and 17 plates. Hamburg: Hoffmann und Campe. 1885.

WE were told, not many years since, that meteorology was not a science, and as the statement was made by one who ought to be an authority, we accepted the dictum with the reverence due to the speaker's position; but a certain amount of mischief lurks in the disposition of most persons, and we certainly wish that it were our friend's fate to have to thoroughly master and be examined upon Dr. Sprung's work. We think that we should never again be told that meteorology is not a science.

The work (after an introduction explanatory of the effects of the earth's rotation, &c.), is divided into five sections, and it will give a rough idea of the character of the book if we specify the sections and the number of pages devoted to each:—(A) Statics of the Atmosphere (*53*); (B) Dynamics of the Atmosphere (*191*); (C) Solar Radiation and its periodic effects (*69*); (D) Periodic phenomena independent of either the earth's daily or annual motion (*3*); (E) Investigations into the variability of meteorological elements, independently of their cause (*16*).

The book reminds one of an experienced general who will not advance until each previous position is thoroughly safe, or like a good builder who pays special attention to the foundations, and will not allow the edifice to be advanced till all is perfectly set. Dr. Sprung, by adopting this course, creates in his readers a sentiment of solidity and of reliance which will render his book one which will last—will outlast many others. One result of this is, of course, that the work bristles with formulæ, six or seven on a page; in fact, in the section devoted to the horizontal component of atmospheric motion, there are no fewer than 50 different formulæ. We should, however, leave a false impression if we did not add that mathematical knowledge is by no means indispensable to a reader, and that no one can go through Dr. Sprung's book without having clearer and sounder views on meteorological subjects than he had before. Take, for instance, the following passage respecting the evaporation from a water surface:—

"The evaporation from a freely exposed water surface is therefore favoured by the following circumstances:—(1) High temperature; (2) Small relative humidity of the air resting upon it; (3) Motion of this air, inasmuch as thereby the collection of water molecules in a gaseous form over the liquid is avoided; (4) Small atmospheric pressure, inasmuch as with it the number of the down-pressing molecules decreases."

We are glad to see that so cautious a writer as Dr. Sprung accepts Baron Wrangel's explanation of the Bora of the Black Sea, which we cannot help thinking will afford suggestions useful to the Royal Meteorological Society's Helm Wind Committee.

Dr. Sprung's *Lehrbuch* reflects credit upon himself and upon Dr. Neumayer, Director of the Deutschen Seewarte, by whose authority it was prepared.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1885.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | TotalRain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 73·8 | 28 | 31·1 | 8 | 59·7 | 42·2 | 41·0 | 72 | 119·3 | 26·9 | 2·63 | 19 | 6·0 |
| Malta | 84·3 | 5 | 51·1 | 18 | 74·3 | 58·2 | 55·3 | 72 | 138·0 | 46·0 | ·00 | 0 | 2·6 |
| *Cape of Good Hope* | 74·0 | 7 | 34·6 | 31 | 64·5 | 46·3 | ... | ... | ... | ... | 3·73 | 11 | 5·2 |
| *Mauritius* | 82·6 | 5 | 64·1 | 27 | 78·7 | 69·4 | 65·3 | 77 | 131·7 | 50·8 | 7·40 | 17 | 5·2 |
| Calcutta | 103·7 | 26 | 67·2 | 7 | 96·4 | 76·8 | 74·5 | 71 | 164·7 | 63·0 | 4·84 | 10 | 3·3 |
| Bombay | 90·3 | 30 | 75·2 | 2 | 88·9 | 79·5 | 75·4 | 76 | 148·9 | 67·0 | ·02 | 1 | 1·7 |
| Ceylon, Colombo | 90·4 | 18 | 73·8 | 8*a* | 88·3 | 76·0 | 73·5 | 76 | 147·0 | 64·2 | 9·22 | 24 | 6·7 |
| *Melbourne* | 75·0 | 2 | 41·2 | 14 | 61·6 | 48·2 | 46·1 | 73 | 125·0 | 33·0 | 1·23 | 14 | 7·5 |
| *Adelaide* | 80·6 | 3 | 42·0 | 7 | 67·7 | 53·7 | 47·0 | 61 | 138·5 | 38·4 | 2·24 | 16 | 6·7 |
| *Wellington* | 62·0 | 5 | 38·0 | 12 | 56·8 | 46·2 | 48·1 | 80 | 116·0 | 34·0 | 5·18 | 24 | ... |
| *Auckland* | 65·5 | 10 | 40·0 | 31 | 61·8 | 50·6 | 47·9 | 73 | 124·0 | 30·0 | 4·64 | 19 | 6·7 |
| Jamaica, Kingston | 91·5 | 20 | 69·1 | 6 | 86·2 | 72·7 | 72 3 | 76 | ... | ... | 2·72 | ... | 4·8 |
| Barbados | 83·0 | var. | 69·0 | 3*b* | 82·0 | 72·0 | 72·5 | 80 | 149·0 | ... | 4·32 | 12 | 6·0 |
| Toronto | 74·1 | 25 | 28·1 | 12 | 60·6 | 42·9 | 43·4 | 70 | 134·0 | 22·4 | 2·26 | 14 | 6·1 |
| New Brunswick, Fredericton | 83·2 | 26 | 24·9 | 4 | 64·9 | 38·1 | 39·1 | 64 | ... | ... | 2·90 | 8 | 4·3 |
| Manitoba, Winnipeg | 80·1 | 29 | 19·0 | 6 | 62·3 | 38·0 | 43·0 | 62 | ... | ... | 1·94 | 12 | 5·8 |
| British Columbia, Victoria | 75·0 | 5 | 36·0 | 1 | ... | ... | ... | ... | ... | ... | 1·30 | 13 | ... |

*a* And 10. *b* And 19.

### Remarks, May, 1885.

Malta.—Mean temp. 65°·0; mean hourly velocity of wind 8·7 miles, velocity on 5th, 31 miles per hour from 4 to 6 p.m.; sea temp. rose from 64° to 70°. J. Scoles.

*Cape of Good Hope.*—Max temp. 0°·5, and min. temp. 4°·6 below average; a strong shock of earthquake at 11·40 p.m. on 10th. W. Ellerton Fry.

*Mauritius.*—Rainfall 2·15 in. and mean temp. 0°·3 above average; prevailing wind E. S.E., mean hourly velocity 10·1 miles, extremes 23·9 miles on 1st, and 1·9 miles on 17th; L on 13th, T and L on 14th and 15th, T on 16th. C. Meldrum, F.R.S.

*Colombo.*—T8S on 14 days, L on 15 other days. F. C. H. Clarke, Major R.A.

*Melbourne.*—Rainfall ·93 in., and humidity 5 below average; mean temp. of air 1°·5, of dew point 0°·1, pressure ·086 in., and amount of cloud 1·0 above average; prevailing winds N., strong on 9 days; heavy dew on 5 days.
R. L. J. Ellery, F.R.S.

*Adelaide.*—Rainfall nearly an inch below average; mean temp. (60°·7) 3°·1 above average, and the highest recorded in 28 years; mean pressure (30·187 in.) ·069 in. above average; mean amount of cloud also considerably in excess, especially at 6 and 9 p.m., the means for those hours being the highest on record. W. E. Cooke.

*Wellington.*—A very wet month almost throughout; cold in the early part, warmer later; prevailing winds N.W. and S.E., frequently stormy and cold. Mean temp. (51°·5) 1°·5 below average; rainfall ·50 in. above average; H on 14 and 15th.
R. B. Gore.

*Auckland.*—On the whole a showery and unsettled month, with a predominence of S.W. wind. Pressure and rainfall above the average; mean temp. below it; heavy R on 22nd, 1·53 in. T. F. Cheeseman.

Barbados.—Rainfall 3 per cent. below average; mean temp. (76°) average; prevailing wind N.E., mean hourly velocity 12·5 miles, 13 per cent. above the average, extremes 16·2 miles and 6·2 miles; 3 days partly clouded. R. Bowie Walcott.

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# SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·29 | XI. | Rhayader, Nantgwillt.. | 7·65 |
| ,, | Margate, Birchington... | 2·04 | ,, | Carno, Tybrith ... ..... | 5·11 |
| ,, | Littlehampton ..... | 3·19 | ,, | Corwen, Rhug ..... | 2·90 |
| ,, | Hailsham ..... | 3·54 | ,, | Port Madoc ..... | 7·71 |
| ,, | I. of W., St. Lawrence. | 3·13 | ,, | I. of Man, Douglas ..... | 3·14 |
| ,, | Alton, Ashdell..... | 3·60 | XII. | Stoneykirk, Ardwell Ho. | 3·22 |
| III. | Winslow, Addington ... | 4·01 | ,, | Melrose, Abbey Gate ... | 1·27 |
| ,, | Oxford, Magdalen Col... | 3·51 | XIII. | N. Esk Res. [Penicuick] | 1·65 |
| ,, | Northampton ..... | 3·62 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | 2·38 | ,, | Glasgow, Queen's Park. | 2·49 |
| ,, | Wisbech, Bank House.. | 3·04 | XV. | Islay, Gruinart School.. | 2·51 |
| IV. | Southend ..... | 2·34 | XVI. | St. Andrews, Pilmour Cot | 1·67 |
| ,, | Harlow, Sheering ... .. | 2·78 | ,, | Balquhidder, Stronvar.. | 5·51 |
| ,, | Rendlesham Hall ..... | 2·49 | ,, | Dunkeld, Inver Braan.. | 2·74 |
| ,, | Diss ..... | 2·81 | ,, | Dalnaspidal H.R.S. ... | 5·21 |
| ,, | Swaffham ..... | 3·37 | XVII. | Keith H.R.S. ..... ..... | 2·64 |
| V. | Salisbury, Alderbury ... | 3·78 | ,, | Forres H.R.S. ..... ... | ·93 |
| ,, | Warminster ..... | 4·19 | XVIII. | Strome Ferry H.R.S.... | 4·88 |
| ,, | Calne, Compton Bassett | 4·82 | ,, | Lochbroom ..... | 3·38 |
| ,, | Ashburton, Holne Vic.. | 8·13 | ,, | Tain, Springfield..... | ·90 |
| ,, | Holsworthy, Clawton... | 3·57 | ,, | Loch Shiel, Glenaladale | 8·96 |
| ,, | Hatherleigh, Winsford. | 4·92 | ,, | Invergarry ..... | 5·39 |
| ,, | Lynmouth, Glenthorne. | 4·52 | XIX. | Lairg H.R.S. ..... | 1·59 |
| ,, | Probus, Lamellyn ..... | 4·16 | ,, | Forsinard H.R.S. ..... | 3·73 |
| ,, | Wincanton, Stowell Rec. | 3·59 | ,, | Watten H.R.S. ..... | 1·22 |
| ,, | Wells, Westbury..... | 3·77 | XX. | Dunmanway, Coolkelure | 7·48 |
| VI. | Bristol, Clifton ..... .. | 6·43 | ,, | Fermoy, Gas Works ... | 2·27 |
| ,, | Ross ..... | 3·27 | ,, | Tralee, Castlemorris ... | 2·23 |
| ,, | Wem, Sansaw Hall..... | 3·24 | ,, | Tipperary, Henry Street | 2·71 |
| ,, | Cheadle, The Heath Ho. | 3·57 | ,, | Newcastle West ..... | 2·25 |
| ,, | Worcester, Diglis Lock | 3·51 | ,, | Miltown Malbay..... | 2·51 |
| ,, | Coventry, Coundon ..... | 4·00 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | 2·91 | XXI. | Carlow, Browne's Hill.. | 1·83 |
| ,, | Ketton Hall [Stamford] | 3·11 | ,, | Navan, Balrath ..... | 2·14 |
| ,, | Horncastle, Bucknall ... | 2·47 | ,, | Mullingar, Belvedere ... | 2·57 |
| ,, | Mansfield, St. John's St | 2·59 | ,, | Athlone, Twyford ..... | 3·30 |
| VIII. | Macclesfield, The Park. | ... | XXII. | Galway, Queen's Col .... | 2·88 |
| ,, | Walton-on-the-Hill..... | 3·43 | ,, | Clifden, Kylemore ..... | 5·67 |
| ,, | Lancaster, South Road. | 3·51 | ,, | Crossmolina, Enniscoe.. | 3·70 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 1·84 |
| IX. | Wakefield, Stanley Vic. | 1·80 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | 2·41 | ,, | Rockcorry..... | 2·19 |
| ,, | Scarborough..... | 1·49 | ,, | Warrenpoint ..... | 3·30 |
| ,, | East Layton [Darlington] | 2·25 | ,, | Newtownards ..... | ·63 |
| ,, | Middleton, Mickleton .. | 1·95 | ,, | Belfast, New Barnsley.. | 2·83 |
| X. | Haltwhistle, Unthank.. | 1·69 | ,, | Cushendun ..... | 2·51 |
| ,, | Shap, Copy Hill ..... | 3·65 | ,, | Bushmills ..... ..... | 2·15 |
| XI. | Llanfrechfa Grange ..... | 5·79 | ,, | Stewartstown ..... | 2·01 |
| ,, | Llandovery ..... | 4·94 | ,, | Buncrana ..... | 2·56 |
| ,, | Castle Malgwyn ..... | 4·27 | | | |

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# NOVEMBER, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 3·31 | + ·87 | ·68 | 26 | 18 | 58·7 | 30 | 28·3 | 17 | 5 | 13 |
| II. | | Maidstone (Hunton Court)... | 2·42 | — ·48 | ·50 | 26 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 3·26 | + ·51 | ·52 | 26 | 18 | 58·7 | 3 | 29·0 | 18 | 6 | 11 |
| III. | | Hitchin ..... | 3·40 | + ·79 | ·39 | 26 | 19 | 55·0 | 29 | 23·0 | 17 | 10 | ... |
| ,, | | Banbury ..... | 4·14 | + 1·43 | 1·10 | 3 | 18 | 56·0 | 28*a* | 25·0 | 18 | 6 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·97 | + ·14 | ·52 | 30 | 20 | 58·0 | 28 | 22·0 | 15 | 9 | ... |
| ,, | | Norwich (Cossey) ..... | 2·79 | — ·52 | ·44 | 3 | 17 | 58·0 | 28*a* | 27·0 | 16 | 8 | 14 |
| V. | | Weymouth(LangtonHerring) | 3·35 | ... | ·65 | 3 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple ..... | 2·81 | — 1·34 | ·52 | 27 | 14 | 59·0 | 29 | 33·0 | 17 | 0 | ... |
| ,, | | Bodmin ..... | 4·56 | — ·76 | 1·00 | 25 | 21 | 57·0 | 29 | 34·0 | 15*b* | 0 | 4 |
| VI. | | Stroud (Upfield) ..... | 4·00 | + 1·06 | ·81 | 2 | 16 | 55·0 | 29 | 28·0 | 15*c* | ... | ... |
| ,, | | ChurchStretton(Woolstaston) | 3·57 | + ·13 | ·62 | 27 | 22 | 55·5 | 29 | 26·0 | 16*d* | 5 | 11 |
| ,, | | Tenbury (Orleton) ..... | 3·24 | + ·38 | ·61 | 26 | 18 | 58·7 | 29 | 22·0 | 17 | 6 | 7 |
| VII. | | Leicester ..... | 2·90 | ... | ·39 | 29 | 19 | 56·6 | 28 | 25·8 | 16 | 5 | 11 |
| ,, | | Boston ..... | 3·08 | + ·71 | ·90 | 3 | 15 | 56·0 | 28 | 30·0 | 16 | 3 | ... |
| ,, | | Grimsby (Killingholme)..... | 2·24 | — ·86 | ·47 | 24 | 16 | 56·0 | 2 | 32·0 | 6 | 1 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 2·10 | ... | ·71 | 24 | 17 | 57·0 | 28 | 23·0 | 17 | 6 | ... |
| VIII. | | Manchester (Ardwick)..... | 2·78 | — ·19 | ·73 | 27 | 15 | 57·0 | 3 | 28·0 | 17 | 5 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·55 | — ·21 | ·62 | 27 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 3·39 | — 2·36 | ·97 | 26 | 17 | 52·0 | 27 | 26·0 | 16 | 5 | ... |
| X. | | North Shields ..... | 1·92 | — 1·53 | ·65 | 26 | 14 | 60·5 | 3 | 24·5 | 18 | 5 | 7 |
| ,, | | Borrowdale (Seathwaite)..... | 10·35 | — 1·47 | 3·38 | 26 | 14 | 54·9 | 3 | 23·5 | 16 | 5 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 5·70 | + 1·50 | 1·06 | 27 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 4·31 | — 1·03 | 1·08 | 26 | 10 | 55·0 | 2, 3 | 28·0 | 15*c* | 6 | 9 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 7·15 | ... | 2·18 | 2 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... | 2·54 | — 1·37 | ·60 | 27 | 11 | 58·8 | 3 | 31·0 | 15 | 2 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·94 | — ·97 | 1·11 | 26 | 14 | 54·0 | 3, 4 | 20·0 | 18 | 10 | ... |
| ,, | | Jedburgh (Sunnyside)..... | ·99 | — 2·02 | ·40 | 26 | 10 | 57·0 | 3 | 17·0 | 18 | 12 | ... |
| XIV. | | Douglas Castle (Newmains) | 2·66 | — ·89 | 1·21 | 26 | 11 | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 4·32 | — 1·04 | ·90 | 26 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 4·44 | ... | ·75 | 3 | 15 | 56·4 | 4 | 25·0 | 18 | 5 | ... |
| ,, | | Mull (Quinish)..... | 3·78 | ... | 1·48 | 2 | 15 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·60 | — ·95 | ·60 | 27 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... | 1·77 | — 1·38 | ·64 | 26 | 13 | 56·0 | 3 | 22·0 | 18 | 6 | ... |
| VII. | | Braemar ..... | 3·82 | + ·05 | 2·02 | 26 | 13 | 58·0 | 3 | 9·5 | 18 | 13 | 22 |
| ,, | | Aberdeen ..... | 2·07 | ... | ·55 | 26 | 17 | 59·0 | 2 | 18·0 | 17 | 11 | ... |
| VIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... | 7·20 | — 1·98 | ... | ... | ... | 59·0 | 3 | 23·0 | 16 | 11 | 21 |
| XIX. | | Dunrobin ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Orkney (Sandwick)..... | 2·07 | — 1·37 | ·42 | 6 | 14 | 57·7 | 3 | 29·5 | 14 | 3 | ... |
| XX. | IRELAND. | Cork (Blackrock)..... | 3·76 | — ·85 | ·93 | 25 | 21 | 59·0 | 29 | 29·0 | ... | 2 | ... |
| ,, | | Dromore Castle ..... | 6·23 | ... | 1·00 | 1 | 16 | 58·0 | 16 | 30·0 | 14 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 3·73 | ... | 1·39 | 25 | 18 | 54·5 | 29 | 27·5 | 15 | 1 | 9 |
| ,, | | Killaloe ..... | 2·50 | ... | ·36 | 4 | 15 | 54·0 | 2 | 27·0 | 15 | 6 | ... |
| XXI. | | Portarlington ..... | 1·56 | — ·84 | ·30 | 25 | 19 | 59 0 | 4 | 28·0 | 14 | 4 | ... |
| ,, | | Dublin (FitzWilliam Square) | 2·40 | — ·12 | ·88 | 26 | 17 | 62·1 | 3 | 31·0 | 15 | 1 | 10 |
| XII. | | Ballinasloe ..... | 2·24 | — ·76 | ·44 | 2 | 16 | 54·0 | 2, 7 | 23·0 | 15 | 6 | ... |
| XIII | | Waringstown ..... | 1·64 | — 1·07 | ·70 | 26 | 11 | 60·0 | 3 | 21·0 | 14 | 7 | 10 |
| ,, | | Londonderry (Creggan Res.). | 2·63 | ... | ·57 | 4 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 2·64 | — ·41 | ·53 | 25 | 16 | 57·0 | 28 | 28·0 | 16 | 6 | ... |

*a* And 29. *b* And 16. *c* And 17. *d* And 18.

+ Shows that the fall was above the average; — that it was below it.

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# METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The cold frosty weather of the middle of the month, assisted materially by intermittent fresh winds from the E.N.E, afforded excellent opportunity for wheat sowing.

BANBURY.—Very heavy R fell on 3rd, causing floods, followed by a fortnight of cold weather, tolerably dry but misty; the last week was wet and milder. Mean temp. (42°·7) slightly above the average. Fog on 3 days, wet mist on 5, high wind on 2.

CULFORD.—A very wet month, with occasional frosts and wind, and but little sunshine.

LANGTON HERRING.—Rainfall ·29 in. and mean temp. slightly, below the average. From 6th to 12th there was scarcely any variation of pressure or of temp., and very little sunshine, the prevailing wind being N.E. Fog on 21st and 22nd.

BODMIN.—A very mild November; mean temp. 46°·1.

WOOLSTASTON.—R and fog prevailed during the greater part of the month; mean temp. 40°·3.

ORLETON.—The first half of the month was cloudy and gloomy with an average temp. and not much R; from the 15th to the 19th severe frost occurred every morning with a dry cold wind; the remainder of the month was very stormy with heavy falls of R and little sunshine. The fluctuations of pressure during the month were great and frequent; on the 28th and 29th the rivers Teme and Severn were much flooded. Mean temp. about 0°·7 above the average.

LEICESTER.—A dull and dreary month, mist and fog prevailing almost every day; there were a few sharp frosts; H on 27th.

KILLINGHOLME.—The weather was very unsettled but not severe; there was a good deal of strong wind, but no gale to do damage.

MANCHESTER.—A fairly seasonable month, though without much frost; the weather generally was dull, but there were a few days of bright sunshine.

NORTH SHIELDS.—Fog on seven days, S on one only.

SEATHWAITE.—There was a long spell of dry weather in the middle of the month, but on the three days, 2nd to 4th, 3·66 in. of R fell, and on the 26th and 27th, 5·11 in.

## WALES.

HAVERFORDWEST.—The month commenced, wet; very dark, calm weather with rather low temp. set in on the 9th, and continued to the 13th, when R fell; from 14th to 25th was very cold with keen easterly winds and a very wet stormy period closed the month. One of the most unfortunate Autumns remembered. Some barley could not be taken in until the fine calm weather between the 14th and 25th; dense fog on 29th.

LLANDUDNO.—A dull November, though exempt from storms; polar winds chiefly prevailed from 8th to 25th. Mean temp. and range of temp. both slightly below the average. H on 5th and 14th.

## SCOTLAND.

CARGEN.—A remarkably dull and gloomy month, with only 32 hours of sunshine, the average being 92 hours; mean temp. 0°·6 below average.

JEDBURGH.—Rainfall smaller than in any November of the previous 20 years, and springs all over the district were never before known to be so low. The

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first three weeks were marked by great stillness of the atmosphere, and little or no sunshine. Primroses were in bloom on 10th.

OBAN.—A very fine month, and an early arrival of frost without being followed by the usual stormy sequence is the feature in this district. S on 5th and 13th; H on 5th and 27th; first frost on 13th; very fine aurora on 18th, heavy gale on 27th.

QUINISH.—The first week was wet and stormy, the remainder of the month very fine.

ABERDEEN.—Rainfall considerably below the average; aurora seen on 5th; S and sleet on 14th; lunar corona on 15th.

CULLODEN.—An unusually dry month, frost prevailing more or less throughout.

## IRELAND.

WATERFORD.—A very mild month, rainfall about the average; there were ripe strawberries in the garden on 16th.

KILLALOE.—A fine open month, with moderate rainfall and mild temp.

DUBLIN.—A mild, very dull month, S.E. and E. winds preponderating to a remarkable extent; the rainfall was very small up to 21st, but a stormy rainy period followed, lasting nearly to the close. The month was very mild (mean temp. 45°·1), but not so mild as November, 1881 (49°·4) which was by far the warmest November in 20 years. November was also warmer in 1866 (45°·4), and in 1874 (45°·8) than in the present year. There was actually an increase of temp. from October to November. H on 15th, sleet on 4th, lunar corona on 21st, fog on 6 days. Mean temp. 1°·4 above the average; mean humidity 88; mean amount of cloud 6·7; prevailing winds S.E. and E.

WARINGSTOWN.—A wonderfully dry and fine month.

EDENFEL.—The first and last weeks were wet and unsettled; the intermediate fortnight was calm and fine, and occasionally clear and frosty; the number of rainy days was considerably less than the average.

---

## EARLY RECORDS OF FROST.

*To the Editor of the Meteorological Magazine.*

SIR,—In Burton's "Chronology of Stamford" I find that "a very severe frost commenced in October, 760, and continued to February, 761. Also another from the beginning of November, 1076, to April, 1077. In November, 1844, a frost set in and continued with very little intermission until April, 1845; the greatest degree of cold was on Friday morning, the 14th of March."—I am, Sir, yours faithfully,

FRED. COVENTRY.

*Ketton Hall, Stamford, June 2nd*, 1885.

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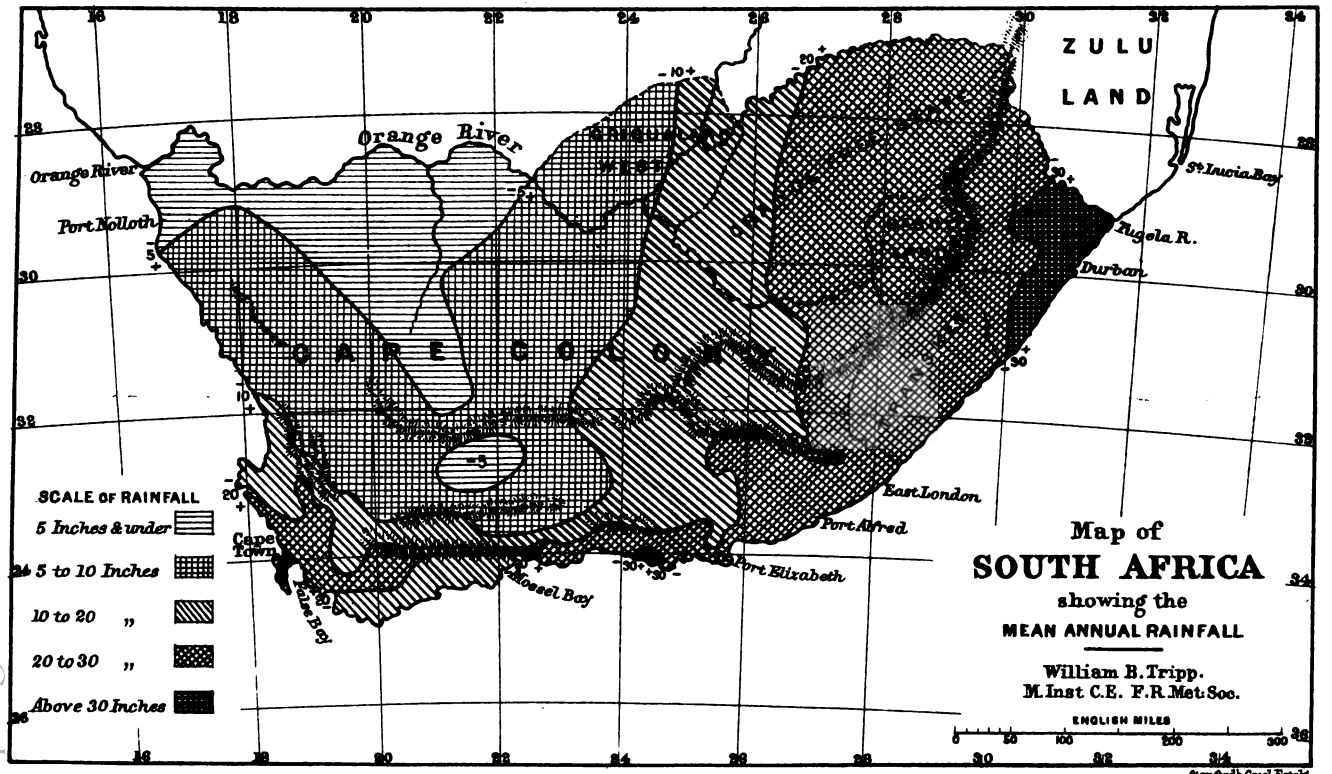


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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXL.] JANUARY, 1886. [PRICE FOURPENCE, or 5s. per ann. post free.

## RAINFALL IN SOUTH AFRICA.

BY WILLIAM B. TRIPP, M.INST.C.E., F.R.Met.Soc.

1. Little has been known until recently on the subject of Rainfall in South Africa, taken broadly over the whole country, although observers have for many years been keeping records at isolated stations.

2. There has also been for many years a Meteorological Commission in existence at Cape Town, and in the report for 1883 an interesting table was published giving the means, monthly and yearly, at all stations where records have been kept for at least five years, with the altitude above sea level, and the latitude and longitude for each station.

There are also given in the reports several additional records of stations where the registers are not complete.

From these data the writer has coloured a map of South Africa, with the idea of showing the distribution of the total yearly rainfall; the curves divide the area into districts where the mean yearly rainfall is—

(1) Under 5 inches.
(2) From 5 ,, to 10 inches.
(3) ,, 10 ,, ,, 20 ,,
(4) ,, 20 ,, ,, 30 ,,
(5) Above 30 ,,

He has also compiled a table which gives the quarterly rainfall at some of the stations above referred to, at which records have been kept for at least five years, with other particulars of altitudes and wettest months, &c.

With regard to the map, there are many parts where the results are merely approximate.

The positions also of many places on even the best published maps of South Africa do not agree with their positions as indicated by the latitudes and longitudes given in the reports, indicating that the former positions are in many cases erroneous.

These differences would make, in many cases, a considerable



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difference in the position of the curves, &c.; in fact, a new and thoroughly revised map of South Africa is much required.

There are also, doubtless, particularly along the mountain ranges, many wet strips and spots where no definite records are kept, and which, therefore, cannot at present be shown on the map. Multiplication of records, as well as general local knowledge, will, no doubt, reveal many such places.

3. South Africa may be described as a central table land, rising in successive terraces from the sea coast. The country has been subject to great erasion from water, and the mountains with which the country is studded, and the deep valleys, locally termed "kloofs," with which it is intersected, are principally due to this cause.

In some cases the hills are covered with forests, but generally they are now denuded of such covering. Where forests still exist, the author considers it probable that the rainfall is much greater than would be the case if they did not. The hills themselves are, however, doubtless the chief agents in causing precipitation, and they have, of course, to be taken as they are found in nature; while the hand of man can, in many cases, clothe them with forests, and the author considers this to be most important. For there is this difference in the result of the rainfall, as its useful effects are seen in the streams which issue from the mountain "kloofs." When these take their rise in an area denuded of forest, their volumes are highly variable, their beds being dry for, in some cases, 300 days in the year; their only existence being, in fact, as torrents after sudden thunderstorms.

When, however, it fortunately happens that the streams take their rise in an area still largely clothed with forests, they are frequently perennial, as the action of the forest tends to keep the soil moist and cool, preventing evaporation and enabling the rain to soak into the ground and fill the underground reservoirs, from which it flows in constant streams capable of being utilised in various ways for the service of man; whereas in the other case, the effects of the rain are transient and much less valuable, and in many cases disastrous.

Thus forests, where they exist, produce a result similar to that which could be effected by the construction, at considerable cost, of a series of storage reservoirs. The author therefore considers it of the highest importance, for various climatic and economic reasons, that the efforts which have been inaugurated of late years by the Cape Government for the preservation, renewal, and creation of forests should be continued with energy and perseverance.

4. The climate over such a large tract of country as South Africa varies, of course, considerably; the rainfall varies from 2 in. to 50 or 60 in. doubtless, and perhaps more in some of the mountain districts; in the N.W. corner of Natal it is considerably over 30 in.

Dividing the country according to the half-yearly distribution of rainfall, we find tat on the western and southern sides the fall is generally greater in the winter half of the year from April to Septem-

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ber, than in the summer half from October to March; May, June and July being the wettest months, and the N.W. the general rain-bearing wind. On the eastern side, however, the fall is greater in the summer half, March and February being the wettest months, and the S.E. the rain-bearing wind.

On the south east coast these dividing line between these two different characteristics appears to run out to sea very nearly at Port Alfred, where the fall in both halves of the year appears to be very nearly identical, that in the summer half being rather the greater of the two.

The writer resided and kept records for some years at King William's Town in the Eastern province, where on a total of 283 days, from June 1880, to May 1883, 70 in. of rain were registered, 30·25 in. of which (recorded on 242 days) were made up of falls under 0·50 of an in., 19·88 in. (on 28 days) from 0·50 in. to 1 in., and 19·87 in. (on 13 days) of falls of from 1 in. or upwards in twenty-four hours.

The heaviest fall on any one day was 2·04 in., and the next heaviest fall was 3·11 in. in 48 hours.

Although this record proves that the rains are moderate and tolerably distributed, and do not all occur in sudden storms, yet the writer has heard accounts of sudden falls there of a very different character, and most disastrous in their results.

*Quarterly Rainfall at some of the Stations given in the Report of the Cape Town Meteorological Commission for 1883, at which records have been kept for at least five years, with the height of the station above sea level, and division into the Meteorological Districts.*

| LOCALITY, &c. | Elevation above Sea Level. | Jan. to March. | April to June. | July to Sept. | Oct. to Dec. | Totals. | Wettest Month. |
|---|---|---|---|---|---|---|---|
| | ft. | in. | in. | in. | in. | in. | |
| 1.—CAPE PENINSULA. *Six Stations given in the Report.* | | | | | | | |
| Royal Observatory..... | 37 | 2·24 | 10·18 | 8·91 | 3·48 | 24·81 | June |
| Bishops Court ..... | 250 | 3·97 | 21·52 | 19·84 | 8·23 | 53·56 | June |
| June is the wettest month at all stations except Simon's Town, at which May and July are equal, and have the fall slightly greater. | | | | | | | |
| 2.—SOUTH WEST. *Nine Stations.* | | | | | | | |
| Somerset West ..... | 100 | 2·20 | 9·20 | 9·05 | 3·72 | 24·17 | July |
| Stellenbosch ..... | 400 | 2·05 | 9·71 | 8·63 | 4·27 | 24·66 | May |
| Paarl ..... | 500 | 1·89 | 11·29 | 11·44 | 5·41 | 30·03 | June |
| Robertson ..... | 600 | 1·72 | 3·54 | 3·36 | 2·27 | 10·89 | April |
| July has the greatest fall at four out of the nine stations, May comes next with three, April and June follow with one each. | | | | | | | |
| 3.—WEST COAST. *Six Stations.* | | | | | | | |
| Groote Port, Malmesbury ... | | 1·56 | 7·13 | 7·11 | 2·71 | 18·51 | May |
| Clan William ..... | 300 | 0·69 | 3·75 | 3·31 | 1·46 | 9·21 | July |
| Piquetberg ..... | 770 | 1·51 | 5·92 | 6·51 | 3·50 | 17·44 | Aug |
| At three stations May has the greatest fall, at two July, and at one August. | | | | | | | |

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4.—SOUTH COAST. *Seven Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bredasdorp ... ..... | 250 | 4·46 | 5·13 | 5·29 | 3·85 | 18·73 | Mar. |
| Mossel Bay ..... | 105 | 4·32 | 3·53 | 5·02 | 3·10 | 15·97 | Feb. |
| Port Elizabeth..... | 181 | 4·48 | 6·19 | 6·19 | 6·09 | 22·95 | May |

At four stations March is the wettest month, May and October at one each.

5.—SOUTHERN KARROO. *Five Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lady Smith ..... | 2000 | 3·19 | 3·38 | 3·34 | 2·02 | 11·93 | April |
| Amalienstein ..... | 1500 | 3·63 | 3·58 | 3·17 | 3·36 | 13·74 | May |
| Ondtshorn ..... ..... | 1000? | 1·92 | 2·41 | 2·75 | 1·45 | 8·53 | Aug. |

April and August are wettest at two stations each, and May at one.

6.—WEST CENTRAL KARROO. *Six Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Prince Albert ..... | 2100 | 2·14 | 2·97 | 1·14 | 1·46 | 7·71 | April |
| Lower Nels. Poort..... | 3100 | 4·81 | 1·87 | 1·51 | 1·93 | 10·12 | Mar. |

At five out of the six stations March has the greatest fall, at the remaining one April.

7.—EAST CENTRAL KARROO. *Nine Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Graaff Reinet ..... | 2500 | 5·48 | 2·62 | 2·22 | 4·22 | 14·54 | Feb. |
| Somerset East... . ..... | 2400 | 8·80 | 3·71 | 2·97 | 5·97 | 21·45 | Mar. |

March is the wettest month at seven stations, February at two.

8.—NORTHERN KARROO. *Twelve Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cradock ..... | 2856 | 6·49 | 2·21 | 1·78 | 2·71 | 13·19 | Mar. |

March is the wettest month at all the stations.

9.—NORTHERN BORDER. *Three Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pella ..... | 1800 | 0·78 | 0·97 | 0·22 | 0·24 | 2·21 | May |
| Hopetown..... ..... | 3600 | 5·80 | 1·79 | 1·07 | 2·07 | 10·73 | Mar. |

At two stations March, and at one May, are the wettest months; there is no rain at Pella in November.

10.—SOUTH EAST. *Nine Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Grahams Town ..... | 1800 | 8·67 | 5·45 | 6·24 | 8·43 | 28·79 | Mar. |
| King Williams Town... | 1314 | 9·47 | 4·29 | 4·12 | 7·84 | 25·72 | Feb. |
| East London, W. ... .. | 20 | 7·95 | 6·66 | 6·79 | 6·52 | 27·92 | Mar. |

March wettest month at eight, February at one station.

11.—NORTH EAST. *Three Stations.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Queens Town ..... | 3500 | 10·11 | 2·86 | 1·69 | 5·98 | 20·64 | Mar. |
| Aliwal, N. ..... | 4400 | 12·37 | 3·66 | 1·74 | 6·91 | 24·68 | Feb. |

March wettest at two, February at one station.

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## SUMMARY OF WETTEST MONTHS.

| | | | |
|---|---|---|---|
| March | at | 40 | stations. |
| May | ,, | 9 | ,, |
| July | ,, | 6 | ,, |
| June | ,, | 6 | ,, |
| Feb. | ,, | 5 | ,, |
| April | ,, | 4 | ,, |
| Aug. | ,, | 3 | ,, |
| Oct. | ,, | 1 | ,, |
| Also May and July equal and wettest at | | 1 | ,, |
| Total | ... | 75 | stations given in the Report. |

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## REVIEWS.

*Lightning Conductors, their History, Nature and Mode of Application.* By RICHARD ANDERSON, F.C.S., &c. Third Edition, revised, rearranged and enlarged. 8vo., xv.—470 pages. London: E. and F. N. Spon, 1885.

WE are glad to find that Mr. Anderson's work upon Lightning Conductors has reached a third edition, and to note that in its preparation the author has had the assistance of the long and varied experience of Dr. R. J. Mann. The book is so large and so good that one might almost dismiss it with the verdict that it tells everything that there is to tell about lightning conductors, and never leads one wrong; but as it has got to the 3rd edition, it may get to the 13th, and if so, some of the following remarks may be useful.

It wants a list of engravings; such a list often enables one to turn up a paragraph readily, and in this book it might have prevented some repetitions, *e.g.*, page 344 and 234. We may mention that the engravings are numerous and generally very good, but on p. 179, a faulty engraving in Callaud's *Traité* has been copied as accurately as the Chinaman did when he cracked all the 24 new plates in the places corresponding to the crack in the pattern one. There are two other things to note about the engravings. Mr. Anderson is (rightly we think) an advocate for conductors in the form of tape rather than of rope. We have been so amused by the frequency with which he gives engravings of rope as compared with tape, as to have had them counted with the curious result that there are nearly three times as many representations of rope as of tape. Sometimes engravings appear without explanatory text, *e.g.*, on p. 118 there is a little gem, illustrative of the area of protection afforded by a conductor on a church tower, but we can find no reference to the engraving in any part of the volume, and the subject does not appear to be even mentioned within 11 pages of the engraving.

Mr. Anderson quotes the case of Mrs. Pidgeon, who was struck and marked by lightning near Torquay, but he does not seem to have heard of the clenching case of the boy George Gunn, of Dunse, Berwickshire, in which the so-called tree form was photographed before it faded away.* And similarly he has overlooked the remarkable parallelism between the accident near Crieff, of which he gives an excellent engraving on p. 312, and the accident at Lilleshall, in Shropshire, in 1884, reported and engraved in the *Quar. Jour. Roy Met. Soc.*, Vol. XI., p. 7.

His list of accidents and his bibliography are very valuable, but each will bear a little more time spent upon it: *e.g.*, p. 322, Rubinslaw should be Rubislaw; p. 324, "West End Church, near Southampton," and "St. James's Church, West End, Hants," are probably identical; p. 325, "Clevendon" should be "Clevedon," and "Rolley' "Trolley."

* *Met Mag.*, Vol. XVIII. (1883), pp. 81, 104, 120.

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So, again, in the list of books there are a lot of little trifles which may as well be put right: *e.g.*, on p. xi. "Fait E. M." should be "Macfait E." or "Fait E. Mac." "Forster, J." should be "Forster, T.," and the description of the two editions of Ganot are rather "mixed."

These, however, are all trifles, and the book itself, like one of Captain Toynbee's logs, may be dismissed with the title "Excellent."

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*Report on the East Anglian Earthquake of April 22nd*, 1884. By RAPHAEL MELDOLA, F.C.S., &c., and WILLIAM WHITE, F.E.S. (*Essex Field Club Special Memoirs, Vol. I.*) 8vo., x.—224 pages, 19 cuts and 4 plates. London: Macmillan & Co., 1885.

Events follow each other in such swift succession that even the great English earthquake—certainly the greatest for four centuries—is on the high road to oblivion within two years of its occurrence. Professor Meldola's report is, however, well worth waiting for; it is a very thorough piece of work, and the way in which he dissects both popular notions and scientific theories is quite amusing. The result is that we have in one volume a complete account of the earthquake, with its damage to 20 churches, 11 chapels and 1,213 buildings, and yet without the loss of one human being, and an exhaustive criticism on all branches of the subject.

Nor have Messrs. Meldola and White been left alone in the work, for though on them has fallen all the actual labour of writing the report, they have had help from two of the most experienced living seismologists—Prof. Ewing, a past President of the Seismological Society of Japan, and Prof. Milne, the present Secretary of that great Earthquake Society. Among the geologists whose views are reported we note several members of the Geological Survey, *e.g.*, Messrs. Holmes, Kinahan, Topley and Whitaker, also Prof. O'Reilly and Mr. Woodward. With reference to the disturbance of the level of water in wells, there are the views of Prof. Bonney, F.R.S., Mr. Clegg, C.E., Mr. Radford Sharpe, and Mr. De Rance, F.G.S.

As we have already stated, it is at least four hundred years since an equally violent earthquake has occurred in this country; it is fortunate for science that the Essex Field Club possessed two members with the knowledge and the industry requisite to produce such a report out of the chaos of manuscript which had been collected, and that the Club has had the courage to incur the cost of printing and illustrating it. Let all who wish well to a rising scientific society, and all who are interested in earthquakes, British or Foreign, support the Club and encourage those who have had the labour of preparing the report by procuring a copy, which we are sure will interest them and instruct them.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1885.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0–100 | ° | ° | inches | | |
| England, London | 84·7 | 4 | 41·4 | 11 | 70·9 | 50·7 | 48·3 | 67 | 127·4 | 36·4 | 1·99 | 11 | 4·9 |
| Malta | 90·4 | 19 | 58·8 | 8 | 79·9 | 64·8 | 61·5 | 71 | 140·6 | ... | ·00 | 0 | 1·4 |
| *Cape of Good Hope* | 71·2 | 1 | 34·0 | 1 | 63·3 | 46·8 | ... | ... | ... | ... | 6·18 | 13 | 4·7 |
| *Mauritius* | 79·2 | 1 | 59·8 | 21 | 75·0 | 65·3 | 60·3 | 74 | 123·6 | 46·2 | 4·36 | 22 | 5·3 |
| Calcutta | 103·3 | 2 | 76·2 | 19 | 92·7 | 79·4 | 77·7 | 80 | 162·5 | 72·4 | 11·40 | 18 | 6·9 |
| Bombay | 92·7 | 8 | 77·0 | 11 | 89·0 | 81·1 | 77·3 | 78 | 153·2 | 74·2 | 5·11 | 22 | 6·7 |
| Ceylon, Colombo | 86·7 | 11*a* | 72·6 | 7 | 83·8 | 75·6 | 74·3 | 84 | 150·0 | 65·0 | 18·82 | 26 | 8·5 |
| *Melbourne* | 62·1 | 1 | 30·2 | 22 | 53·8 | 42·8 | 42·4 | 81 | 114·3 | 21·1 | 3·63 | 18 | 7·2 |
| *Adelaide* | 62·5 | 1 | 36·0 | 12 | 57·6 | 45·4 | 43·4 | 74 | 120·8 | 26·3 | 3·23 | 24 | 6·1 |
| *Wellington* | 60·3 | 8 | 34·5 | 24 | 55·7 | 44·1 | 44·7 | 83 | 115·0 | 29·5 | 3·87 | 9 | 3·8 |
| *Auckland* | 62·5 | 28 | 40·0 | 15 | 59·1 | 48·8 | 47·8 | 79 | 118·0 | 29·0 | 2·16 | 12 | 6·8 |
| Jamaica, Kingston | 92·0 | 27 | 70·6 | 13 | 87·0 | 74·0 | 73 0 | 77 | ... | ... | ·46 | ... | 5·3 |
| Barbados | 84·0 | 27 | 71·0 | var. | 82·0 | 73·0 | 74·4 | 82 | 145·0 | ... | 2·47 | 15 | 7·0 |
| Toronto | 79·1 | 27 | 41·5 | 9 | 70·8 | 49·0 | 51·2 | 70 | ... | 34·5 | 4·19 | 12 | 5·0 |
| New Brunswick, Fredericton | 86·7 | 26 | 35·5 | 7 | 73·2 | 48·4 | 51·1 | 70 | ... | ... | 3·33 | 18 | 6·2 |
| Manitoba, Winnipeg | 83·8 | 30 | 31·4 | 8 | 71·0 | 47·2 | 53·3 | 73 | ... | ... | 3·05 | 12 | 5·0 |
| British Columbia, Victoria | 5·0 | 27 | 41·0 | 2 | 65·7 | 48·6 | ... | ... | ... | ... | ·25 | 8 | ... |

*a* And 27. *b* And 15.

### REMARKS, JUNE, 1885.

MALTA—Mean temp. 71°·1; mean hourly velocity of wind 9·5 miles; sea temp. rose from 70° to 77°. J. SCOLES.

*Mauritius.*—Rainfall 2·14 in. above, mean temp. 0°·7, and mean hourly velocity of wind 0·2 mile below average; prevailing wind S.E. by E, extremes of velocity 28·9 miles on 10th and 1·9 mile on 25th. C. MELDRUM, F.R.S.

*Colombo.*—TSS on 1st, T on 3, and L on 6 other days. J. H. SYMONDS.

*Melbourne.*—Mean temp. of air 1°·4 and of dew point 1°·0 below average; rainfall 1·71 in., humidity slightly, and amount of cloud ·6 above average; prevailing winds N. and W., strong breezes on 9 days; L on 3 days, H on 1, dense fog on 4. R. L. J. ELLERY, F.R.S.

*Adelaide.*—Rainfall nearly 0·60 in. and mean pressure 0·110 in. above the average of 28 years; mean temp. more than 2° below the average. W. E. COOKE.

*Wellington.*—A fine month with few wet days; N.W. wind till 20th, frequently strong, then easterly and light; mean temp. (49°·9) 0°·9 above the average; rainfall 1·38 in. below the average. T on 8th. fog on 3 days. R. B. GORE.

*Auckland.*—An unusually fine month; rainfall not half the average; mean temp. about the average of 18 years; pressure considerably above the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall only half the average, and the continual drought was severely felt over the greater part of the Island. A slight shock of earthquake was felt in St. David's between 7 a.m. and 8 a.m. on 16th. MAXWELL HALL.

BARBADOS.—Rainfall very small, the total for June having been less on only six occasions in 34 years; mean temp. (76°) about the average; pressure unsteady; mean hourly velocity of wind 13·4 miles, 10 per cent. above the average; extremes 18·4 miles and 8·8 miles. R. BOWIE WALCOTT.

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# SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·50 | XI. | Rhayader, Nantgwillt.. | 3·34 |
| ,, | Margate, Birchington... | 1·08 | ,, | Carno, Tybrith ... ..... | 2·01 |
| ,, | Littlehampton ..... | 1·13 | ,, | Corwen, Rhug ..... | 1·14 |
| ,, | Hailsham ..... | 1·21 | ,, | Port Madoc ..... | 2·55 |
| ,, | I. of W., St. Lawrence. | 1·81 | ,, | I. of Man, Douglas ..... | 2·11 |
| ,, | Alton, Ashdell..... | 1·86 | XII. | Stoneykirk, Ardwell Ho. | 1·75 |
| III. | Winslow, Addington ... | ·96 | ,, | Melrose, Abbey Gate ... | 1·45 |
| ,, | Oxford, Magdalen Col... | 1·02 | XIII. | N. Esk Res. [Penicuick] | 1·85 |
| ,, | Northampton ..... | ·63 | XIV. | Ayr, Cassillis House ... | ... |
| ,, | Cambridge, Beech Ho... | ·79 | ,, | Glasgow, Queen's Park. | 2·19 |
| ,, | Wisbech, Bank House.. | ·80 | XV. | Islay, Gruinart School.. | 3·74 |
| IV. | Southend ..... | 1·08 | XVI. | St. Andrews, Pilmour Cot | 1·01 |
| ,, | Harlow, Sheering ... .. | ·89 | ,, | Balquhidder, Stronvar.. | 6·62 |
| ,, | Rendlesham Hall ..... | 1·06 | ,, | Dunkeld, Inver Braan.. | 2·70 |
| ,, | Diss ..... | 1·30 | ,, | Dalnaspidal H.R.S. ... | 5·28 |
| ,, | Swaffham ..... | 1·39 | XVII. | Keith H.R.S. ..... ..... | 2·32 |
| V. | Salisbury, Alderbury... | 1·42 | ,, | Forres H.R.S. ..... ... | 1·78 |
| ,, | Warminster ..... | 1·27 | XVIII. | Strome Ferry H.R.S.... | 10·71 |
| ,, | Calne, Compton Bassett | 1·27 | ,, | Lochbroom ..... | 10·16 |
| ,, | Ashburton, Holne Vic.. | 3·73 | ,, | Tain, Springfield..... | 1·45 |
| ,, | Holsworthy, Clawton... | 1·74 | ,, | Loch Shiel, Glenaladale | 18·81 |
| ,, | Hatherleigh, Winsford. | 3·16 | ,, | Invergarry ..... | 9·60 |
| ,, | Lynmouth, Glenthorne. | 2·09 | XIX. | Lairg H.R.S. ..... | 1·98 |
| ,, | Probus, Lamellyn ..... | 2·00 | ,, | Forsinard H.R.S. ..... | 2·33 |
| ,, | Wincanton, Stowell Rec. | 1·41 | ,, | Watten H.R.S. ..... | 2·87 |
| ,, | Wells, Westbury..... | 1·64 | XX. | Dunmanway, Coolkelure | 4·42 |
| VI. | Bristol, Clifton ..... .. | 1·23 | ,, | Fermoy, Gas Works ... | 1·87 |
| ,, | Ross ..... | 1·02 | ,, | Tralee, Castlemorris ... | 2·02 |
| ,, | Wem, Sansaw Hall..... | ·52 | ,, | Tipperary, Henry Street | 1·81 |
| ,, | Cheadle, The Heath Ho. | 1·07 | ,, | Newcastle West ..... | 2·11 |
| ,, | Worcester, Diglis Lock | 1·07 | ,, | Miltown Malbay..... | 1·83 |
| ,, | Coventry, Coundon ..... | ·59 | ,, | Corofin ..... | ... |
| VII. | Melton, Coston ..... | ·87 | XXI. | Carlow, Browne's Hill.. | ·82 |
| ,, | Ketton Hall [Stamford] | ·92 | ,, | Navan, Balrath ..... | ·90 |
| ,, | Horncastle, Bucknall ... | ·80 | ,, | Mullingar, Belvedere ... | 1·07 |
| ,, | Mansfield, St. John's St | ·63 | ,, | Athlone, Twyford ..... | 1·07 |
| VIII. | Macclesfield, The Park. | 2·38 | XXII. | Galway, Queen's Col.... | 1·22 |
| ,, | Walton-on-the-Hill..... | 1·64 | ,, | Clifden, Kylemore ..... | 2·75 |
| ,, | Lancaster, South Road. | 1·39 | ,, | Crossmolina, Enniscoe.. | 2·90 |
| ,, | Broughton-in-Furness .. | ... | ,, | Carrick-on-Shannon ... | 2·01 |
| IX. | Wakefield, Stanley Vic. | ·31 | XXIII. | Dowra ..... | ... |
| ,, | Ripon, Mickley ..... | ·71 | ,, | Rockcorry..... | 1·71 |
| ,, | Scarborough..... | 1·09 | ,, | Warrenpoint ..... | 1·29 |
| ,, | East Layton [Darlington] | ·61 | ,, | Newtownards ..... | ·68 |
| ,, | Middleton, Mickleton .. | 1·23 | ,, | Belfast, New Barnsley.. | 2·20 |
| X. | Haltwhistle, Unthank.. | 1·65 | ,, | Cushendun ..... | 4·05 |
| ,, | Shap, Copy Hill ..... | 3·56 | ,, | Bushmills ..... ..... | 2·73 |
| XI. | Llanfrechfa Grange . .... | 1·97 | ,, | Stewartstown ..... | 1·47 |
| ,, | Llandovery ..... | 2·44 | ,, | Buncrana ..... | 2·97 |
| ,, | Castle Malgwyn ..... | 1·49 | | | |

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# DECEMBER, 1885.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1870–9 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max Deg. | Max Date | Min Deg | Min Date | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·05 | — 1·12 | ·35 | 5 | 11 | 50·8 | 4 | 22·3 | 11 | 13 | 2 |
| II. | | Maidstone (Hunton Court)... | ·85 | — 1·55 | ·32 | 5 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss ..... | 1·02 | — 1·00 | ·33 | 5 | 12 | 50·6 | 17 | 19·3 | 11 | 15 | 1 |
| III. | | Hitchin ..... | ·77 | — 1·28 | ·26 | 30 | 12 | 46·0 | 3 | 21·0 | 8*a* | 20 | ... |
| ,, | | Banbury ..... | ·61 | — 1·54 | ·14 | 5 | 12 | 50·0 | 3*b* | 21·0 | 11 | 19 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·95 | — 1·20 | ·42 | 30 | 10 | 51·0 | 17 | 13·0 | 10 | 16 | ... |
| ,, | | Norwich (Cossey) ..... | 1·22 | — 1·10 | ·30 | 30 | 12 | 50·5 | 17 | 19·0 | 12 | 12 | 1 |
| V. | | Weymouth(LangtonHerring) | 1·77 | ... | ·85 | 5 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple..... | 2·06 | — 1·70 | ·63 | 5 | 14 | 56·0 | 1 | 22·0 | 11 | ... | ... |
| ,, | | Bodmin ..... | 2·51 | — 2·94 | 1·24 | 5 | 16 | 51·0 | 17 | 22·0 | 11 | 7 | 1 |
| VI. | | Stroud (Upfield) ..... | 1·06 | — 1·37 | ·45 | 5 | 11 | 50·0 | 3*c* | 20·0 | 10 | 17 | ... |
| ,, | | ChurchStretton(Woolstaston) | ·91 | — 1·88 | ·14 | 28 | 17 | 50·0 | 16*b* | 22·0 | 8, 9 | 13 | 1 |
| ,, | | Tenbury (Orleton) ..... | ·93 | — 1·58 | ·20 | 28 | 15 | 52·3 | 17 | 17·3 | 11 | 17 | 1 |
| VII. | | Leicester ..... | ·65 | ... | ·19 | 30 | 11 | 52·2 | 23 | 22·2 | 11 | 12 | 2 |
| ,, | | Boston ..... | ·93 | — 1·14 | ·33 | 30 | 8 | 50·0 | 16 | 17·0 | 11 | 14 | ... |
| ,, | | Grimsby (Killingholme)..... | ·84 | — 1·59 | ·21 | 9 | 12 | 51·0 | 16 | 20·0 | 12 | 8 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·96 | ... | ·25 | 4 | 11 | 54·0 | 16 | 21·0 | 10 | 12 | ... |
| VIII. | | Manchester (Ardwick)..... | 2·65 | + ·12 | ·83 | 30 | 11 | 51·0 | 17 | 23·0 | 8*d* | 10 | ... |
| IX. | | Wetherby (Ribston Hall) ... | ·31 | — 1·90 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 3·41 | — 1·87 | ·64 | 30 | 17 | 50·0 | 18 | 15·0 | 10 | ... | ... |
| X. | | North Shields ..... | ·96 | — 2·13 | ·20 | 9 | 12 | 56·5 | 16 | 16·0 | 11 | 15 | 1 |
| ,, | | Borrowdale (Seathwaite)..... | 7·54 | — 6·19 | 1·41 | 30 | 19 | 52·8 | 16 | 17·7 | 8 | 13 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 1·93 | — 1·98 | ·58 | 5 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 2·07 | — 3·06 | ·50 | 5 | 10 | 53·0 | 16 | 18·0 | 10 | 9 | 1 |
| ,, | | Plinlimmon (Cwmsymlog) ... | 2·62 | ... | ·67 | 30 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno..... ..... | 1·33 | — 1·52 | ·40 | 30 | 8 | 54·0 | 3 | 28·0 | 10*e* | 8 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·17 | — 2·36 | ·62 | 3 | 12 | 54·0 | 16 | 17·4 | 11 | 12 | ... |
| ,, | | Jedburgh (Sunnyside)..... | ·57 | — 1·88 | ·24 | 30 | 7 | 56·0 | 2, 3 | 10·0 | 11 | 12 | ... |
| XIV. | | Douglas Castle (Newmains) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XV. | | Lochgilphead (Kilmory)..... | 5·60 | — ·58 | 1·25 | 30 | 23 | ... | ... | ... | .. | ... | ... |
| ,, | | Oban (Craigvarren) ..... | 6·75 | ... | ... | ... | 23 | 53·0 | 16 | 24·0 | 7 | 7 | ... |
| ,, | | Mull (Quinish)..... | 6·54 | ... | 1·16 | 30 | 24 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·10 | — 1·56 | ·80 | 4 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Arbroath ..... ..... | 1·14 | — 1·76 | ·30 | 3 | 10 | 54·0 | 16 | 21·0 | 7*e* | 8 | ... |
| XVII. | | Braemar ..... ..... | 2·92 | — ·51 | ·80 | 2 | 12 | 53·2 | 16 | 12·2 | 7 | 16 | 2 |
| ,, | | Aberdeen ..... ..... | 2·28 | ... | ·67 | 21 | 16 | 57·0 | 16 | 22·0 | 10*e* | 13 | ... |
| XVIII | | Skye (Sligachan) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Culloden ..... ..... | 2·56 | + ·72 | ... | ... | ... | 56·0 | 16 | 15·3 | 10 | 10 | 2 |
| XIX. | | Dunrobin ..... ..... | 2·84 | ... | ·56 | 4 | 12 | 58·0 | 16 | 21·0 | 7 | 11 | ... |
| ,, | | Orkney (Sandwick)..... .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XX. | IRELAND. | Cork (Blackrock) ..... | 1·78 | — 2·98 | ·29 | 19 | 19 | 57·0 | 2 | 24·0 | 8 | 9 | ... |
| ,, | | Dromore Castle ..... | 2·67 | ... | ·55 | 2 | 12 | 55·0 | 18 | 25·0 | 22 | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·95 | ... | ·49 | 5 | 15 | 51·5 | 3 | 21·5 | 11 | 9 | 1 |
| ,, | | Killaloe ..... | 1·67 | ... | ·27 | 27 | 18 | 56·0 | 19 | 23·0 | 8 | 15 | ... |
| XXI. | | Portarlington ..... ..... | ·73 | — 2·13 | ·14 | 3 | 13 | 52·0 | 15 | 29·0 | 26 | 12 | ... |
| ,, | | Dublin (FitzWilliam Square) | ·74 | — 1·84 | ·16 | 5 | 10 | 57·7 | 16 | 24·3 | 11 | 7 | 1 |
| XXII. | | Ballinasloe ..... ..... | 1·62 | — 1·86 | ·53 | 20 | 21 | 52·0 | 16 | 19·0 | 11 | 14 | ... |
| XXIII | | Waringstown ..... ..... | 1·24 | — 1·72 | ·34 | 28 | 11 | 56·0 | 16 | 18·0 | 10 | 13 | 1 |
| ,, | | Londonderry (Creggan Res.). | 2·80 | ... | ·54 | 3 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 1·86 | — 1·54 | ·55 | 3 | 16 | 54·0 | 16 | 21·0 | 10 | 13 | ... |

*a* And 10. *b* And 17. *c* And 31. *d* And 9, 11. *e* And 11.
+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Cold, damp, foggy weather characterized the month, with occasional intervals of bright sunshine and paroxysms of severe early morning frosts; crops all that could be desired at the close.

BANBURY.—Mean temp. 37°·7. S on 3 days; high wind on 2; fog on 8.

CULFORD.—The temperature during the month was very fluctuating, the frost at times being very severe but not of long duration. S on 9th and 29th.

LANGTON HERRING.—The rainfall was 1·30 in. below the average of December for the last ten years; the mean temp. was more than half a degree below the average, and the pressure was higher than in any month since December, 1883; high winds on 4th and 28th, dense fog on 17th, L on 29th.

BODMIN.—Mean temp. 39°·4.

STROUD.—A cold, gloomy December with very little sun; slight S on the hills on 6th and 29th.

WOOLSTASTON.—The rainfall was very slight, but S fell on 5th, 6th, 28th, and 29th. A severe frost set in on 6th, which lasted a week. Mean temp. 37°·5.

ORLETON.—Mean temp. about 1°·3 below the average of 24 years. The first 12 days were very cold with much clear sky, and severe frost almost every night; the remainder of the month was very changeable with much cloud and fog and occasional frosts. Pressure high throughout, but fluctuating. The wind was frequently rough, especially on 4th and 28th. S on 6th, 28th, and 29th.

KILLINGHOLME.—The month was very dry until the closing days, when S fell which soon disappeared.

MANCHESTER.—December was rather wintry, but there was no fall of S. Hard frost prevailed for several days in the early part of the month, but it was then mild until the last three days. The weather generally was dull, gloomy, and damp, but no very dense fogs occurred. T on 4th.

NORTH SHIELDS.—Mock suns were seen on 28th and 31st; S fell on 6 days, fog occurred on 3.

## WALES.

HAVERFORDWEST.—A dry December. Severe frost prevailed from 2nd to 10th, but the temperature for the whole month was rather above the average. During the continuance of the frost the sunsets were very grand and the colourings of the afterglow magnificent. On the 7th, the Precelly range was covered with S to the depth of several inches. From 12th to 19th the air was constantly damp and the sky overcast.

LLANDUDNO.—The wind and weather were rather variable, and there was more than the average amount of frost though of no great severity. The mean temp. was just half a degree below the average, the mean daily range being about half a degree above the average and the monthly range a degree and a half below it. Very little R fell, except on the last four days. S on 29th.

## SCOTLAND.

CARGEN.—A dull, gloomy month, with great and sudden variations of temp. and pressure. Mean temp. 38°·8, exactly the average; severe frost prevailed from 6th to 11th. Only 39 hours of sunshine were recorded, the average being 59 hours; for 11 consecutive days (11th to 21st inclusive) only one hour of sunshine was recorded. Remarkably beautiful cloud effects were observed at sunset on 28th and 29th. Gale on 3rd, L on 28th, S on 29th.

JEDBURGH.—The weather was, on the whole, fine and open, and out-door work was scarcely impeded. Springs had not begun to rise, and the ground was very dry at the close. Very high winds prevailed from 27th to 30th inclusive. S on 5 days.

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OBAN.—A month remarkable for extraordinary changes of weather and wind—from frost to E and gales. On the whole the commencement was seasonable and frosty, and the second half showery with very high temp, until the heavy S storm of 28th. An unusual absence of sunlight was noted. H on 3rd, 27th and 28th; S on 28th and 29th; aurora on 6th; gales on 7 days.

ABERDEEN.—Rainfall more than an inch below the average; aurora on 6th, H on 22nd; S on 3 days.

CULLODEN.—The weather during the month was not very severe; the keenest frost was from 5th to 11th, and during the remainder of the month the weather was fine and open. S fell to some depth twice.

IRELAND.

BLACKROCK.—The month was notably misty, with very little sunshine and frequent unexpected changes of temp. from unseasonable warmth to sharp frost. Mean temp. 41°·8.

DROMORE.—The month, though it commenced with a terrible storm from S.W., was very fine and mild.

WATERFORD.—A dry and generally mild month with a rainfall less than half the average. S on 4th and 6th; dense fog on 20th.

KILLALOE.—Sharp frosts prevailed in the early nights of the month, with many bright fine days. The rainfall was light. Mean temp. 41°·0.

DUBLIN.—Very changeable as regards temperature, but generally a fine although cloudy month. Pressure considerably above the average. A sharp frost prevailed between 7th and 12th, and another brief cold spell occurred after the 27th. Mean temp. (42°·2) 0°·7 above the average; mean humidity 84; mean amount of cloud 6·6; prevailing winds W., W.S.W., W.N.W. H on 7th and 28th, S and sleet on 4 days; lunar corona on 23rd, fog on 7 days.

WARINGSTOWN.—A very dry month and, with the exception of one week's hard frost (from 5th to 12th), mild and pleasant.

EDENFEL.—With the exception of the week of dry and pleasant frost, which terminated on 11th, the month was unusually mild and calm, with scanty rainfall.

## ROYAL METEOROLOGICAL SOCIETY.

The usual Monthly meeting of this Society was held on Wednesday evening, December the 11th, at the Institution of Civil Engineers; Mr. R. H. Scott, F.R.S., president, in the chair.

Mr. J. Hartnup, Mr. A. W. Preston, Mr. R. Sheward, and Mr. W. B. Worthington, B.Sc., M.Inst. C.E., were balloted for and duly elected Fellows of the Society.

The following papers were read :—

(1.) "On the Influence of Forests upon Climate," by Dr. A. Woeikof, Hon.Mem.R.Met.Soc. The first step towards a scientific investigation of the influence of forests upon climate was taken by the establishment of the Bavarian Forest meteorological stations. This example was followed by Germany, France, Switzerland, Italy, and other countries. As a general result it was found that during the warmer season the air and earth temperatures were lower in the forest as compared with contiguous woodless places, that their variations were less, and that the relative humidity was greater. Dr. Woeikof's discussion of this question shows that in the western portions of the Old World extensive forests materially influence the temperature of neighbouring localities, and that the normal increase of temperature from the Atlantic Ocean towards the interior of the continent is not only interrupted by their agency, but they cause the

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summer to be cooler in regions situated further in the interior than those nearer the sea. Hence forests exert an influence on climate which does not cease at their borders, but is felt over a greater or less district, according to the size, kind, or position of the forests. From this it naturally follows that man, by clearing the forests in one place and planting others in another, may considerably affect the climate.

(2.) "Report on the Phenological Observations for 1885," by the Rev. T. A. Preston, M.A., F.R.Met.Soc. The year has been a very dry one, and this has acted in such a manner on vegetation that although the winter was mild, plants were very late in flowering and lasted only a short time. The bloom was often profuse, and as bees and other insects could visit it, the crop of fruit was unununusually great; the apples, for instance, were often of bad quality owing to the enormous number on the trees; whilst in the case of wild fruits, the brilliant colour of the bushes when in fruit was quite as beautiful as when in bloom. But at the same time the drought acted very prejudicially, especially to root crops and bush fruit, as well as to strawberries. In the case of the root crops, the seed had great difficulty in germinating, and the weak plants were at once overpowered by insect pests, so that the crops of turnips were generally complete failures. The insect pests also did much damage to bush fruit, while the drought prevented the strawberries from swelling. The corn did not suffer to any great extent, the dry season allowing the land to be prepared; and although the straw was often short, the yield was not unsatisfactory. A general absence of butterflies was noticed in some places. In the south of England the white butterflies were at one time most abundant, but the autumn butterflies were not so plentiful as usual.

(3.) "Etudes sur les crépuscules rosées," by Prof. A. Ricco of Palermo.

(4.) "The Storm of October 15th, 1885 at Partenkirchen, Bavaria," by Col. M. F. Ward, F.R.Met.Soc. This was the most destructive storm which has occurred in this valley since the winter of 1821-22. The storm burst suddenly at 7 p.m., and lasted about half-an-hour, but in that short period nearly every house was unroofed, and it is computed that in one forest alone above 250,000 trees were laid prostrate.

## THE BIELA METEORS.

We regret that a perfectly formed $\chi$ (chi) in Col. Ward's letter (p. 163) was misprinted as $\gamma$ (gamma), and that we failed to notice it when reading the proof. The meteors were expected to radiate from $\gamma$ Andromedæ; the observed radiant was by some observers stated to be an area of some extent, by others, as by Col. Ward, it was defined as near an individual star, in his case $\chi$ *not* $\gamma$ Andromedæ.

END OF VOL. XX.

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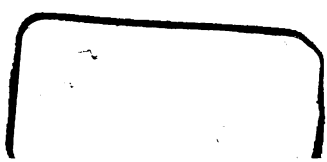

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